Environmental Services for Air Education and Training Command

Environmental Assessment for the Construction of a Photovoltaic Solar Array at Laughlin Air Force Base, Texas

October 2011

Submitted to:

47 CES/CEAN
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AETC CONTRACT NO. FA3002-07-D-0016
AETC TO 3044

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE **OCT 2011**	2. REPORT TYPE	3. DATES COVERED **00-00-2011 to 00-00-2011**

4. TITLE AND SUBTITLE **Environmental Assessment for the Construction of a Photovoltaic Solar Array at Laughlin Air Force Base, Texas**	5a. CONTRACT NUMBER 5b. GRANT NUMBER 5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER 5e. TASK NUMBER 5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Tetra Tech Inc,700 N. St. Mary's Street Suite 300,San Antonio,TX,78205**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S) 11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT
Under Executive Orders 13514 and 13423, federal agencies are required to reduce greenhouse gas emissions by 2020; and the Energy Policy Act of 2005 requires agencies increase the amount of renewable energy consumed. In order to achieve these goals, agencies must ensure that at least half of the statutorily required energy comes from a renewable energy source and where feasible, implement renewable energy generation projects on agency property for agency use. The United States Air Force, in order to comply with the Executive Orders is proposing to construct a Photovoltaic (PV) Solar Array on Laughlin AFB. Currently Laughlin AFB purchases energy through Champion Electric, by purchasing the energy Laughlin AFB does not have control over the power source and therefore cannot assist the Department of Defense in meeting its required goal. The construction of the PV Solar Array would provide the installation with up to 100 percent of its required energy, allowing for Laughlin AFB to use only renewable energy. The preferred location for the PV Solar Array would be 85 acres in size and be located on an undeveloped portion within the western side of the installation. Construction of the PV Solar Array would include disturbing of soil and construction of the Array and an unmanned facility that would house inverters and batteries. An alternative location for the PV Solar Array is located at the undeveloped northeast corner of the installation. Under the No-Action Alternative, there would be no construction of the PV Solar Array. The following resources were identified for study in this Environmental Assessment: Air Quality Climate, Biological Resources, Cultural Resources, Geology and Soils, Hazardous Materials/Hazardous Wastes/Solid Wastes, Land Use, Noise, Socioeconomics, Environmental Justice and the Protection of Children, Utilities/Infrastructure, and Water Resources.

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**	**Same as Report (SAR)**	**360**	

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std Z39-18

FINDING OF NO SIGNIFICANT IMPACT

ENVIRONMENTAL ASSESSMENT
CONSTRUCTION OF A PHOTOVOLTAIC SOLAR ARRAY

LAUGHLIN AIR FORCE BASE, TEXAS

1.0 INTRODUCTION

The United States Air Force (Air Force) Laughlin Air Force Base (AFB) proposes to construct and operate a photovoltaic (PV) solar array system on Laughlin AFB in response to legislation requirements including Energy Policy Act (EPACT) of 2005, Executive Order (EO) 13423, and EO 13514; and subsequently Headquarters Air Education Training Command (AETC) Strategic Energy Vision. Within the past several years, costs and demand for energy produced through non renewable resources, such as crude oil, have increased dramatically. In response to this energy crisis, Congress passed the EPACT of 2005 (PL 109-58), which was signed by President Bush on 8 August 2005. Among the many energy conservation measures, the Act directs the federal government to use more renewable energy, with a goal of using 7.5 percent or more by 2013. The EOs required agencies to obtain at least half of the electricity consumed by agency property to be obtained from renewable sources, and the AETC Strategic Energy Vision stated that the goal of AETC is to have renewable energy account for 100 percent electricity generated/utilized at installations. Meeting these goals will reduce the risk to critical missions from a loss of commercial power.

Throughout the Environmental Impact Analysis Process various methods to generate electricity through renewable process were analyzed. During this process, it was observed that obtaining electricity through solar power is the preferred method of electricity generation.

Outside sources of electric power used by Laughlin AFB are currently provided by Champion Electric. The construction and operation of a 10-megawatt (MW) solar array would provide the base with up to 100 percent of its required electricity, which would virtually eliminate the Air Force's reliance on electric power through the grid. The Alternative A - Preferred Alternative would support the EPACT, increase overall Air Force use of renewable energy, and allow Laughlin AFB to support the Department of Defense (DoD) installation energy policy long-range goal for renewable energy use.

The Alternative A - Preferred Alternative and Alternatives were assessed in an Environmental Assessment (EA) which is incorporated herein by reference.

2.0 DESCRIPTION OF PREFERRED ACTION AND ALTERNATIVES

Three alternatives were analyzed in this EA; Alternative A – Preferred Alternative, Alternative B – Alternate Site Alternative, and Alternative C – No-Action Alternative. The resources that had the potential to be impacted were analyzed for each alternative. A brief discussion of the Preferred Action and Alternatives are below.

2.1 ALTERNATIVE A – PREFERRED ALTERNATIVE

The constructed PV solar array system would be sufficient to provide at least 10 MW alternating current (AC). The solar panels would be mounted on racks, aligned in access rows, and positioned in a southerly direction on approximately 85 acres, as shown on the Preferred Alternative Site on Figure 1. The arrays would be embedded into the ground with concrete footings. An unmanned building would be built to

house inverters and batteries; no heat, water, or sewer would be required for the building. The building would include a containment system to safeguard battery leaks. Inverters would be used to transform power from direct current (DC) to AC. Transformers would be installed on the site to step-up voltage so that it is compatible with the Laughlin AFB electrical system; the stepped-up power would be connected to the Laughlin AFB power distribution system. Security fencing would completely surround the solar array site.

The solar array would tie into the Laughlin AFB electrical system through 15 kilovolt ampere (kVA) switches. This would protect the integrity of the power during electrical failures and lightning strikes. The power from the solar array would be designed to continuously feed power to the Laughlin AFB electrical system. It is expected that the system would meet all of the on-base electrical power demands. Concrete encased conduit connecting the solar panel arrays to the switch would be placed underground in trenches that could be as deep as 5 feet in some areas, but typically no deeper than 3 feet, and covered with earth. Following emplacement of the conduit, disturbed areas would be graded and re-vegetated to maintain current drainage patterns. Transformers would be located at least 100 feet away from other facilities. Regular cleaning of the solar panels would be accomplished by either rinsing with water, blowing with compressed air, or a combination of both. All solid waste generated during construction would be removed by the contractor and disposed of at an appropriate disposal facility outside of the base.

Figure 1 Preferred Alternative and Alternate Site Alternative Locations

2.2 ALTERNATIVE B – ALTERNATE SITE ALTERNATIVE

The Alternative B - Alternate Site Alternative would be the same as the Preferred Alternative except for the location of the solar array. Under the Alternate Site Alternative the PV solar array would be within the Alternate Site Alternative, as shown in Figure 1, and would comprise of approximately 75 acres.

2.3 ALTERNATIVE C - NO-ACTION ALTERNATIVE

Under the Alternative C - No-Action Alternative the PV solar array would not be constructed at Laughlin AFB. Laughlin AFB would continue to purchase electricity through Champion Electric. Champion Electric is a retail electricity provider, and does not generate electricity; the company purchases the power from an electricity wholesaler. If this alternative is chosen, it has the potential to affect Headquarters AETC's ability to meet the presidential mandated goals and Air Force directives by not allowing for the production of electricity on-site.

3.0 SUMMARY OF FINDINGS FOR PREFERRED ALTERNATIVE

3.1 AIR QUALITY

There would be a short-term negative impact in air quality due to the increase emissions from heavy equipment used during construction; however, there would be a positive long-term impact from the use of the PV solar array. Once the PV solar array is operational, electricity generated for Laughlin AFB using non-renewable sources would no longer need to be generated, thus lowering overall emissions. The activities will occur in an area that is currently classified as "attainment" for National Ambient Air Quality Standards, and will not be subject to a conformity analysis. Public or construction personnel will not be exposed to hazardous levels of air emissions as a result of this alternative.

3.2 CLIMATE

No impacts to climate are expected. Climate could impact clearing, grading, construction, and operation of the PV solar array; these impacts would be seasonal. Rain could delay activities; however, the delays would be expected to be temporary. Minimization measures to reduce any impact resulting from the runoff of rain will be performed.

3.3 BIOLOGICAL RESOURCES

Construction would result in the clearing of up to 85 acres of sparse vegetation. Several individuals of a plant species could be lost during the clearing and grading of the site; however, it is unlikely that an entire plant species would be lost because of the distribution of the species in other locations in Val Verde County. Removing vegetation would result in loss of habitat, a long-term adverse impact. A United States Fish and Wildlife listed endangered species, Black-capped Vireo; two Texas Parks and Wildlife Division (TPWD) designated rare plant species, Longstalk Heimia and Texas Trumpets; and one TPWD designated rare bird, Olive Sparrow, have been observed on Laughlin AFB. The habitat located at the site has not been identified as critical habitat for the Black-capped Vireo and Olive Sparrow; and the species are likely to move and roost in nearby habitat if they are located within the site boundary. Prior to construction of the PV solar array, a species survey will be conducted at the Alternative A - Preferred Alternative site to determine if these species are present. If a Black-capped Vireo is observed, construction of the PV solar array would not occur until the species has migrated from the area. If Longstalk Heimia and/or Texas Trumpets are observed, the species will be left in place and the footprint of the PV solar array will be modified as such to avoid the species.

3.4 CULTURAL RESOURCES

The site is more than 3,000 feet from any prehistoric or historic sites, sacred sites, or traditional cultural properties identified at Laughlin AFB. No impacts to cultural resources are expected.

3.5 GEOLOGY AND SOILS

There would be no long-term adverse effects on geology and soils. The area cleared and graded would be stabilized, where necessary, with compacted fill to provide the base for construction.

3.6 HAZARDOUS MATERIALS/HAZARDOUS WASTE/SOLID WASTE

There are no impacts expected. Prior to the lead batteries arriving at Laughlin AFB, Air Force Form 3952 would be completed and submitted. Once the batteries are spent or show signs of leakage, they would be stored and either recycled or disposed of off-site at an approved facility. Activities will occur adjacent to Military Munitions Response Program sites, but it is unlikely that construction activities would encounter contaminated soils.

3.7 LAND USE

Land use associated with the project location site would be converted from unimproved grounds (developable land) to light industrial use. Since there would be no permanent change in ownership and land use would be consistent with the Laughlin AFB General Plan, no significant impacts on land use are anticipated.

3.8 NOISE

There will be a short-term and long-term increase in noise levels. During the construction, the average noise level would be estimated at 90 A-weighted decibels (dBA), with a baseline level at less than 65 dBA. The operation of the PV solar array has the potential to create additional long-term noise from the installed transformers. Transformers typically generate a noise level ranging from 60 to 80 dBA. Due to the distance to sensitive receptors from the site, both the short-term and long-term level would decrease to an approximate average of 65 dBA, for short-term, and 55 dBA for long-term, prior to reaching the receptors; resulting in no significant impact.

3.9 SOCIOECONOMICS

There will be a short-term beneficial impact. Construction activities would generate 15 jobs during the construction activities, 11 jobs in support of equipment and supply chain activities, and 12 jobs from induced impacts. The workforce would be expected to come from the local Del Rio area, impacts on housing, schools and the local population would not be expected to be significant.

3.10 ENVIRONMENTAL JUSTICE AND THE PROTECTION OF CHILDREN

The construction and subsequent operation of the PV solar array would not create any significant adverse impacts on human health. Construction activities would be limited to sites located on the base where minority or low-income populations are not present, and therefore, would not be affected. Access to the base is restricted to authorized personnel. The construction areas would be restricted to effectively bar any person, including children, from unauthorized access.

3.11 UTILITIES/INFRASTRUCTURE

After the completion of the PV solar array, electricity not utilized by Laughlin AFB would be available for other users and create less demand on the electric grid during times of high energy demand. This will decrease the opportunity for the demand to exceed availability, causing brown-outs. There would be a short-term increase in vehicular traffic during the construction of the PV solar array.

3.12 WATER RESOURCES

Adverse short-term and long-term effects on water resources are unlikely. Clearing, grading, and site preparation associated with construction could potentially affect storm water runoff. Potential impacts include disruption of natural drainage patterns, contamination entering storm water discharge, or sediment loading from construction activities. The construction contractor would be required to write and implement a Construction Storm Water Pollution Prevention Plan to decrease impacts to storm water.

4.0 SUMMARY OF FINDING FOR ALTERNATIVE B – ALTERNATE SITE ALTERNATIVE

The impacts associated with Alternative B – Alternate Site Alternative are similar to those detailed under the Preferred Alternative. The location of the PV solar array would be placed within the Alternate Site where Archeological site 41VV1682 is located; the archeological site would remain undisturbed. Locating the PV solar array within 2,000 feet of the runway would create the potential for a long-term impact by potentially creating a distraction during landing of aircraft.

5.0 SUMMARY OF FINDINGS FOR ALTERNATIVE C - NO ACTION-ALTERNATIVE

The conditions and characteristics anticipated under Alternative C – No-Action Alternative for each resource area will continue at levels under the existing condition. No significant environmental impacts are experienced or generated by the existing condition; therefore, no significant impacts are anticipated for the No-Action Alternative.

6.0 SUMMARY OF CUMULATIVE EFFECTS

The cumulative impact of implementing this action along with other past, present, and reasonably foreseeable future projects within the City of Del Rio and Laughlin AFB were assessed in the attached EA and no significant cumulative impacts were identified.

7.0 SUMMARY OF PUBLIC COMMENTS

The Draft EA was available for a 30-day public review and comment from 7 August 2011 through 7 September 2011 at the Val Verde County Public Library. The availability of the document was advertised in the Del Rio News-Herald newspaper on 7 August 2011.

Two comments were received from the Texas Historical Commission and TPWD respectively. The Texas Historical Commission noted that Archeological site 41VV1682 was within the Alternative B - Alternate Site Alternative; however it was noted that No Historic Properties would be affected on Laughlin AFB. TPWD requested surveys of the site be conducted prior to construction activities, specifically for the Texas Trumpet and the Black-capped Vireo, and construction activities be modified as

a result of the surveys. Text was modified to include the surveys and construction modifications as measures to reduce impacts.

8.0 DECISION

Reasonable alternatives to the Preferred Alternative were considered. The Alternative A - Preferred Alternative was found to be the preferable and most practical action to meet Laughlin AFB purposes and needs. After review of the EA; prepared in accordance with the requirements of the National Environmental Policy Act, the Council on Environmental Quality regulations, and the Environmental Impact Analysis Process (32 CFR Part 989, as amended); I have determined that the Alternative A - Preferred Action would not have a significant impact on the quality of the human or natural environment. There would be no significant cumulative impacts resulting from implementing the Alternative A - Preferred Alternative or Alternative Actions. An Environmental Impact Statement will not be prepared. This decision has been made after taking into account all submitted information and considering a full range of practical alternatives that would meet project requirements and are within the legal authority of the Air Force.

THOMAS E. MURPHY, Colonel, USAF
Commander, 47th Flying Training Wing

4 NOV 11

Date

COVER SHEET

Responsible Agency: 47th Civil Engineer Squadron (47 CES), Laughlin Air Force Base (AFB), Texas

Preferred Alternative: Construction of a Photovoltaic Solar Array at Laughlin AFB, Val Verde County, Texas

Points of Contact: Mr. Gene Moore, 47 CES/CEAN, 251 4th Street, Building 100, Laughlin AFB, Texas 78840, (830) 298-5960, (830) 298-5063, or (830) 298-5029

Report Designation: Environmental Assessment

Abstract: Under Executive Orders 13514 and 13423, federal agencies are required to reduce greenhouse gas emissions by 2020; and the Energy Policy Act of 2005 requires agencies increase the amount of renewable energy consumed. In order to achieve these goals, agencies must ensure that at least half of the statutorily required energy comes from a renewable energy source and where feasible, implement renewable energy generation projects on agency property for agency use. The United States Air Force, in order to comply with the Executive Orders is proposing to construct a Photovoltaic (PV) Solar Array on Laughlin AFB. Currently Laughlin AFB purchases energy through Champion Electric, by purchasing the energy Laughlin AFB does not have control over the power source and therefore cannot assist the Department of Defense in meeting its required goal. The construction of the PV Solar Array would provide the installation with up to 100 percent of its required energy, allowing for Laughlin AFB to use only renewable energy. The preferred location for the PV Solar Array would be 85 acres in size and be located on an undeveloped portion within the western side of the installation. Construction of the PV Solar Array would include disturbing of soil and construction of the Array and an unmanned facility that would house inverters and batteries. An alternative location for the PV Solar Array is located at the undeveloped northeast corner of the installation. Under the No-Action Alternative, there would be no construction of the PV Solar Array.

The following resources were identified for study in this Environmental Assessment: Air Quality, Climate, Biological Resources, Cultural Resources, Geology and Soils, Hazardous Materials/Hazardous Wastes/Solid Wastes, Land Use, Noise, Socioeconomics, Environmental Justice and the Protection of Children, Utilities/Infrastructure, and Water Resources.

PRIVACY ADVISORY NOTICE

Public comments on the Draft Environmental Assessment (EA) were requested pursuant to the National Environmental Policy Act, 42 United States Code 4321, *et seq.* All written comments received during the comment period were considered during Final EA preparation and are provided within this document. Address information received during the comment period was used to compile the project mailing list; however, such personal information will be kept confidential unless release is required by law.

TABLE OF CONTENTS

APPENDICES

LIST OF FIGURES

LIST OF TABLES

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1.0 PURPOSE AND NEED

1.1 INTRODUCTION

This Environmental Assessment (EA) evaluates the potential environmental effects associated with the proposed construction and operation of a photovoltaic (PV) solar array at Laughlin Air Force Base (AFB), Texas. This EA is being prepared in accordance with the requirements of the National Environmental Policy Act (NEPA) of 1969, as amended (42 United States Code [U.S.C.] 4321 *et seq*.); the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (40 Code of Federal Regulations [CFR] 1500–1508); Title 32 CFR Part 989; and all other applicable federal and local regulations. The NEPA requires federal agencies to consider the environmental consequences of all proposed actions in their decision making process. The intent of NEPA is to protect, restore, or enhance the environment through a well-informed decision making process. The CEQ was established under NEPA to implement and oversee federal policy in this process. To this end, the CEQ issued the Regulations for Implementing the Procedural Provisions of NEPA. The CEQ regulations declare that an EA serves to accomplish the following objectives:

- Briefly provide sufficient evidence and analysis for determining whether to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI);
- Aid in an agency's compliance with NEPA when an EIS is not necessary ; and
- Facilitate preparation of an EIS when necessary.

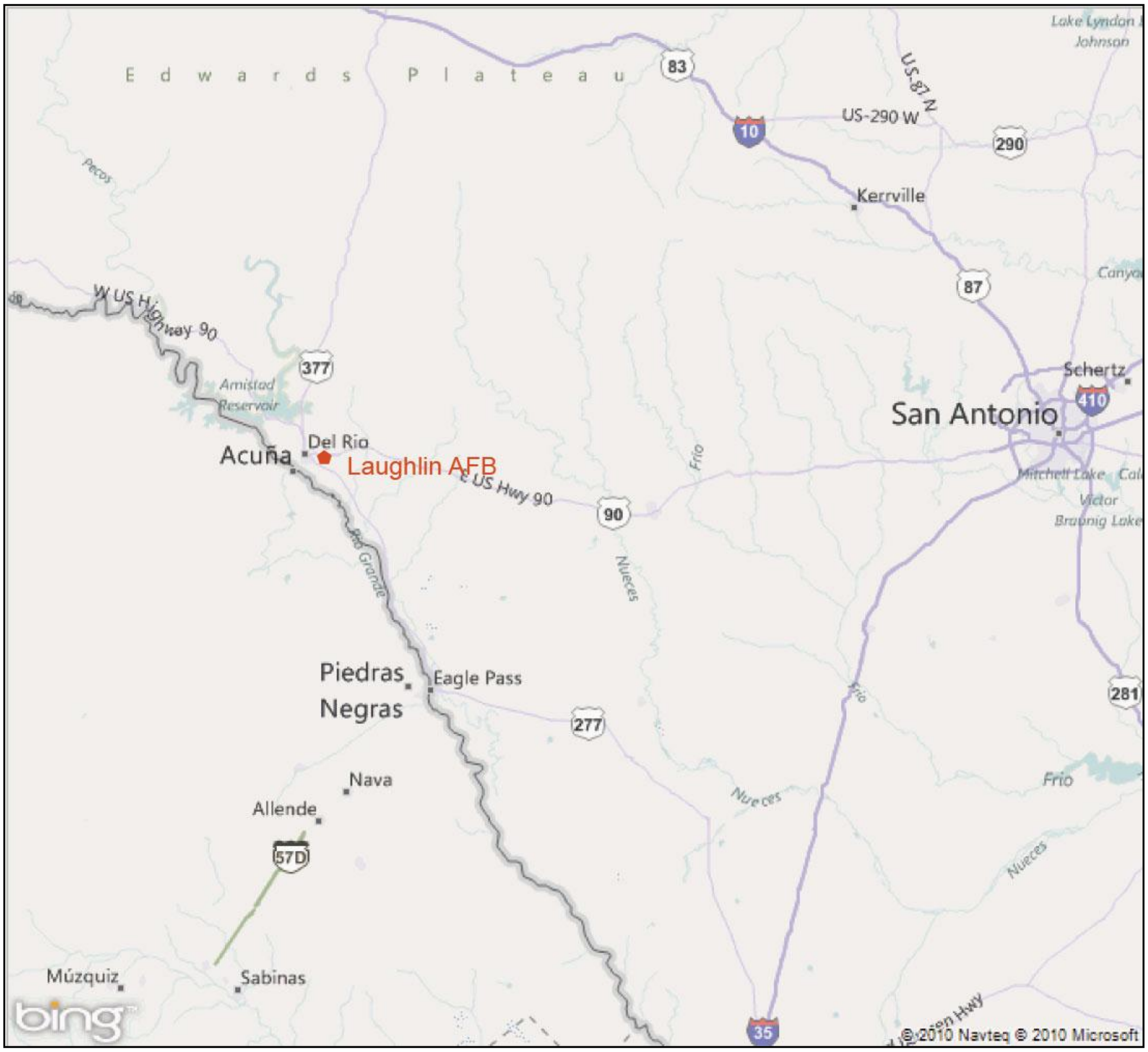
The United States Air Force (Air Force) is representing the Department of Defense (DoD) as the lead agency.

1.2 LOCATION

Laughlin AFB is located in central Val Verde County, Texas approximately 149 miles west of San Antonio, Texas and 7 miles east of Del Rio, Texas as shown on Figure 1-1. The facility covers approximately 4,355 acres of land which does not include the Laughlin Auxiliary Airfield near Spofford, Texas; recreation area at Lake Amistad and Next Generation Radar (NEXRAD) site near Brackettville, Texas (USAF 2011). The Alternative A – Preferred Alternative site is approximately 85 acres and is located on the west side of the base just north of Laughlin Road and the Alternative B – Alternate Site Alternative site is and is located approximately 75 acres located on the northeast side of the main runway (13/31) (Figure 1-2).

1.3 HISTORY

Laughlin Army Air Field was activated on 2 July 1942 as an advanced pilot and crew training school for duel engine aircraft. Named for Lieutenant Jack T. Laughlin, first member of the Del Rio community to die during World War II, the base was re-designated Laughlin Field in 1943. Flying training continued until Laughlin Field was transferred to the Air Materiel Command on 30 October 1945. The base was deactivated between 1945 and 1952.



Source: Bing - 2010

Figure 1-1 Location of Laughlin AFB

When the base was reactivated as Laughlin Air Force Base in May 1952, only one of the original World War II buildings remained. The 364th Pilot Training Wing (PTW) was assigned to the base. Since reactivation, base missions have included aircraft transition training, gunnery training, and basic single-engine pilot training. The base was transferred to the Strategic Air Command (SAC) in 1957. SAC aircraft flew high altitude weather reconnaissance missions and U-2 aircraft flew from the base to participate in the Cuban Missile Crisis. The base was transferred to the Air Training Command in 1963. Nine years later (1972), the 364th PTW was redesignated the 47th Flying Training Wing (FTW). At present, T-6A, T-38C, and T-1A aircraft are used for the year-long undergraduate pilot training program.

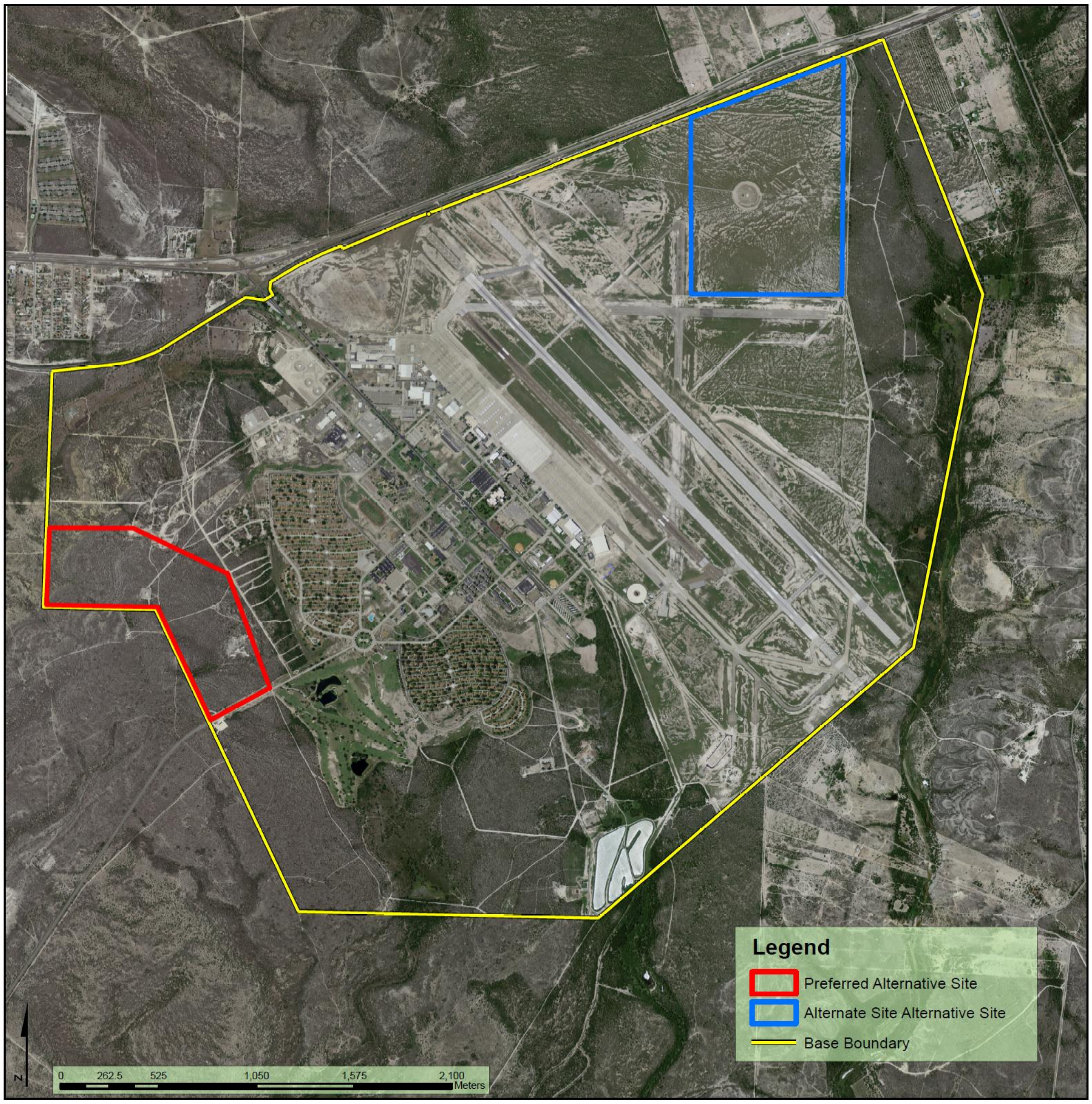


Figure 1-2 Location of the Alternative A – Preferred Alternative and Alternative B – Alternate Site Alternative Sites

1.4 INSTALLATION MISSION

Laughlin AFB is an Air Force Air Education and Training Command (AETC) facility with the primary mission of Specialized Undergraduate Pilot Training (SUPT) using T-6A, T-38C, and T-1A aircraft.

The primary tenant at Laughlin AFB is the 47th FTW, which is responsible for SUPT. This program is a year-long program consisting of T-6A, T-38C, and T-1A aircraft training. Upon completion of the one-year training program, student pilots are awarded their silver wings and are reassigned for advanced follow-on training in their assigned aircraft. The Air Force Reserve, Air National Guard, and foreign students also receive training at Laughlin AFB. The training mission includes the use of 38 state-of-the-art flight simulators and over 239 aircraft that are permanently stationed at Laughlin AFB graduating 307

pilots in FY09. The 47th FTW commands a flying operation which exceeds 84,563 flying hours and 57,976 sorties per year (USAF 2010a).

A number of other tenant organizations are assigned to Laughlin AFB. These include:

- Air Force Office of Special Investigation, Detachment 410: Provides criminal counterintelligence, internal security, and special investigative services.
- Defense Security Service: Conducts, directs, and controls all personnel security investigations, and performs all other investigative functions as directed.
- Defense Reutilization and Marketing Office: Receives excess and surplus government property, and prepares such property for utilization, donation, or sale.
- Area Defense Counsel: Provides military personnel an independent defense counsel free from command influence.

Approximately 1,586 active-duty military personnel are assigned to Laughlin AFB, with approximately one-half residing on-base and one-half residing in the surrounding community. The base employs a civilian work force of approximately 1,056 persons who reside in the surrounding community (USAF 2010a).

1.5 PURPOSE AND NEED FOR THE PREFERRED ALTERNATIVE

Laughlin AFB is required by the Energy Policy Act (EPACT) of 2005, Executive Order (EO) 13423, EO 13514, and subsequently Headquarters AETC Strategic Energy Vision to assist with the reduction of the base's reliance on the local electrical grid, utilize a renewable energy course, reduce greenhouse gas emissions, and construct renewable energy generation projects.

The EPACT (Public Law 109-58) was signed by President George W. Bush on 8 August 2005. The Act, in part, requires that the President, acting through the Secretary of Energy, seek and ensure that, to the extent feasibility and technically practicable, the total amount of electric energy the federal government consumes during any fiscal year should be:

- Not less than 3 percent renewable energy in fiscal years 2007 through 2009;
- Not less than 5 percent renewable energy in the fiscal years 2010 through 2012; and
- Not less than 7.5 percent renewable energy in the fiscal year 2013 and beyond.

Section 203(a) of the EPACT 2005 (42 U.S.C. 15852(a)) identifies solar power as one of the sources of renewable energy. The EPACT 2005 resulted in two EOs 13514 and 13423.

On 24 January 2007 EO 13423, was signed requiring agencies to ensure that at least half of the statutorily required renewable energy consumed by the agency in a fiscal year come from renewable sources; and to the extent feasible, the agency implements renewable energy generation projects on agency property for agency use.

EO 13514, was signed on 5 October 2009, requiring federal agencies increase the use of renewable energy and implement renewable energy generation projects, where feasible, in order to meet increased

energy efficiency requirements to reduce greenhouse gas emissions by fiscal year 2020, and leverage acquisitions to foster markets for sustainable technologies. To accomplish these tasks, EO 13514 set forth goals which includes increasing agency use of renewable energy and implementing renewable energy generation projects on agency property.

As a result of these EOs and DoD and Air Force specific polices, the AETC drafted a Strategic Energy Vision. Within the Vision, AETC references the findings that the Defense Science Board noted in which the complete dependence on local grids is an unacceptable risk to military and Homeland defense missions. To reduce the risk to critical missions from a loss of commercial power the Air Force decided to invest in energy efficient and alternative energy technologies to a level commensurate with their operational and financial value. Ultimately the goal is to achieve 100 percent on-base energy generation capability by use of wind, solar, bio-mass, geothermal, hydroelectric or nuclear means. To do this Laughlin AFB proposes to construct a PV solar array.

Currently Laughlin AFB purchases electric power through Champion Electric through power lines managed by Rio Grande Electric Co-op, Inc. By purchasing electricity through Champion Electric, Laughlin AFB does not have control over the power source and cannot contribute to achieving DoD's and AETC's goals to expand the use of renewable energy per EO 13423, EO 13514, and AETC's Strategic Energy Vision.

The construction and operation of a PV solar array would provide the main base with up to 100 percent of its required electricity and would decrease Laughlin AFB reliance on Champion Energy electrical power and on the local grid. The Preferred Alternative would support the EPACT, increase overall Air Force use of renewable energy, and allow Laughlin AFB to support the DoD installation energy policy long-range goal for renewable energy use. An Air Force form AF 813 was filed for this project in March 2010 (Appendix A).

1.6 RELEVANT STATUTES, REGULATIONS, AND OTHER PLANS

This EA is prepared in compliance with the NEPA (Public Law [PL] 91-190, 1969, as amended), the CEQ Regulations for Implementing the Procedural Provisions of NEPA (40 CFR, 1500-1508, 1993) and Environmental Impact Analysis Process (EIAP) (32 CFR, Part 989). The Air Force, in compliance with NEPA, analyzes the potential environmental impacts of the proposed action and alternatives as identified during the EIAP. As part of the EIAP and NEPA process additional laws and regulations apply or may apply to the proposed action. The Air Force also has directives and plans that may also apply to the proposed action; these must also be addressed.

1.6.1 Interagency and Intergovernmental Coordination and Public Participation

Federal, state, and local agencies with jurisdiction that could be affected by the proposed or alternative actions have been notified and consulted. A complete listing of the agencies consulted may be found in Chapter 8. Interagency and intergovernmental coordination and public participation documentation are presented in Appendix B. This coordination fulfills the *Intergovernmental Cooperation Act of 1968* (42 USC 4231(a) and *Intergovernmental Review of Federal Programs* (EO 12372), which require federal agencies to cooperate with and consider federal, state, and local views in implementing a proposal. EO 12372 is implemented by the Air Force in accordance with Air Force Instruction (AFI) 32-7060, *Interagency and Intergovernmental Coordination for Environmental Planning*.

1.6.2 Other Regulatory Requirements

This EA considers all applicable laws, regulations and Air Force directives and plans, including but not limited to the following:

- United States Air Force Infrastructure Energy Strategic Plan;
- AETC Strategic Energy Vision;
- Laughlin AFB General Plan;
- *Clean Air Act of 1970* (CAA) (42 USC 7401 *et seq*., and any subsequent amendments);
- AFI 32-7040, Air Quality Compliance;
- EO 11990, *Protection of Wetland*;
- *Federal Water Pollution Control Act Amendments of 1972*, commonly known as the *Clean Water Act* (CWA), (33 USC 1251 *et seq*., and any subsequent amendments);
- EO 11988, *Floodplain Management*;
- *Endangered Species Act of 1973* (16 USC 1531-1542, and any subsequent amendments);
- *Pollution Prevention Act of 1990* (42 USC 13101 and 13102 *et seq*., and any subsequent amendments);
- 32 CFR 179, Munitions Response Site Prioritization Protocol;
- National Historic Preservation Act of 1966 (16 USC 470 et seq., and any subsequent amendments);
- Archaeological Resources Protection Act of 1979 (16 USC 470aa-mm, and any subsequent amendments);
- Native American Graves Protection and Repatriation Act of 1991 (25 USC 3001 et seq., and any subsequent amendments); and
- EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations.*

1.7 EO 13045, PROTECTION OF CHILDREN FROM ENVIRONMENTAL HEALTH RISKS AND SAFETY RISKS THE DECISION AND DECISION MAKER

The environmental analysis in this document evaluates the potential environmental concerns and impacts associated with implementation of the proposed action and any reasonable alternatives. The Commander will weigh the analysis presented in this document in the decision-making process associated with the implementation of this proposed action at Laughlin AFB, Texas. The Commander, 47 FTW must decide among the following possible actions:

- Approve the action to construct the Photovoltaic Electric Power Plant to provide electrical power for the main base, or

- Take no action to implement this project at Laughlin AFB (Alternative C - No-Action Alternative).

1.8 ENVIRONMENTAL JUSTICE

EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations, requires each Federal agency to make environmental justice…

> "... part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations ... "

The term *environmental justice* means the fair treatment of people of all races, cultures, incomes, and educational levels with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. The term *fair treatment* implies that no disproportionate share of the negative environmental impacts of pollution or environmental hazards affect any group of people because of a lack of political or economic strength (EO 12898 1994).

1.9 FEDERAL, STATE, LOCAL PERMITS, AND LICENSES ENVIRONMENTAL PLANS

Implementing this Alternative A – Preferred Alternative would disturb more than one-acre of soil; consequently, a Construction Storm Water permit from Texas Commission on Environmental Quality (TCEQ) would be required for the construction contractor and Laughlin AFB. Laughlin AFB plans that are applicable to the Alternative A – Preferred Alternative and Alternative actions are the Laughlin AFB Integrated Natural Resources Management Plan, Integrated Cultural Resources Management Plan; and Spill Prevention, Control, and Countermeasures Plan.

1.10 ORGANIZATION OF THIS DOCUMENT

This EA is organized in the following manner. A cover letter presents an overview of the proposed action, alternatives, and analysis of the impacts and effects that would result from implementing the proposed action or alternative, and also includes the recommendation for the decision maker.

Chapter 1 includes an introduction, history, mission, and other information to inform the reviewers the basic information about the project. Chapter 2 provides a description of the proposed action and any reasonable alternatives, including the no-action alternative. Chapter 3 presents a general description of the current conditions that could be potentially affected by the proposed action. Only those environmental elements that would affect or would be affected by the proposed action or alternatives are described. Chapter 4 describes effects on the environment that would result from implementing the proposed action or alternatives, including cumulative impacts resulting from recently assessed ongoing actions. Chapter 5 lists the members of the interdisciplinary team responsible for preparing the assessment. Chapter 6 includes any published or unpublished reference materials used in preparation of this EA. Chapter 7 is a list of abbreviations and acronyms used in this document and Chapter 8 is the distribution list. The appendices include information not readily available to the public that was used to determine the potential direct, indirect and cumulative effects.

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2.0 DESCRIPTION OF PREFERRED ALTERNATIVE AND OTHER ALTERNATIVES

2.1 ALTERNATIVE A - PREFERRED ALTERNATIVE

The Alternative A - Preferred Alternative is to construct and operate a PV solar array at Site 1 on Laughlin AFB. The PV solar array would be designed to provide at least 10 Megawatts (MW) alternating current (AC) per hour system and would comply with 2008 National Electric Code (NEC) and National Fire Protection Association (NFPA)-70 criteria. The system would be located at the Preferred Site on approximately 85 acres as shown on Figure 2-2. The system would require between 41,000 and 131,000 solar panels mounted on racks (depending on the Watts/per panel), aligned in access rows, and positioned in a southerly direction. The arrays would be embedded into the ground with concrete footings. An unmanned building, less than 10,000 square feet, would be built to house inverters and battery storage; no heat, water, or sewer would be required for the building. The building would include a containment system to safeguard against battery leaks. Inverters would be used to transform direct current (DC) to AC. Transformers would be installed to step up voltage so that it is compatible with the Laughlin AFB electrical system. The stepped-up power would then be connected to the Laughlin AFB power distribution system. Security fencing would completely surround the PV solar array site.

Source: Duke Energy, 8 November 2010

Figure 2-1 PV Solar Array South of San Antonio, Texas

The PV solar array would tie into the Laughlin AFB electrical system through 15 kilovolt ampere (kVA) switches. The switches would protect the integrity of the Laughlin AFB system during electrical failures and lightning strikes. The power from the PV solar array would be designed to continuously feed power to the electrical system using a switch to access Champion Electric electrical power should the PV solar array electrical power feed fail. Excess power produced from the PV solar array could be sold through the grid. It is estimated that the system would meet approximately 100 percent of the electrical power demands of Laughlin AFB. An electric meter would be placed between the switch and the Laughlin AFB power distribution system to measure the power transferred from the system. Conduit connecting the PV solar array to the switch would be placed underground in trenches that could be as deep as 5 feet in some areas, but typically no deeper than 3 feet, and covered with earth. Following emplacement of the conduit,

disturbed areas would be graded to maintain current drainage patterns. Transformers would be located at least 100 feet away from other facilities. Regular cleaning of the solar panels would be accomplished by either rinsing with water, blowing with compressed air, or a combination of both. All solid waste generated during construction would be removed by the contractor and disposed of at an appropriate disposal facility outside of the base. This alternative has been developed as a part of Headquarters AETC Strategic Energy Vision to meet the requirements of EOs 13514 and 13423 and EPACT 2005.

2.2 ALTERNATIVE B - ALTERNATE SITE ALTERNATIVE

Alternative B - Alternate Site Alternative would be the same as the Preferred Alternative except for the location of the PV solar array. Under the Alternate Site Alternative the PV solar array would be located at the alternate site. The Alternate Site, as shown on Figure 2-2, would be approximately 75 acres and would be located at the northwest corner of Laughlin AFB.

2.3 ALTERNATIVE C - NO-ACTION ALTERNATIVE

Under the Alternative C - No-Action Alternative the PV solar array would not be constructed at Laughlin AFB. Laughlin AFB would continue to purchase electricity through Campion Electric. Champion Electric is a retail electricity provider, and does not generate electricity; the company purchases the power from a electricity wholesaler. Laughlin AFB has the opportunity to subscribe to a program in which the provider will purchase electricity from renewable energy sources, on behalf of Laughlin AFB; however, the power purchased will be placed into the grid and mixed with electricity provided by other sources (including non-renewable) and provided to Laughlin AFB and their other customers. At this time, by purchasing electricity from Champion Electric, there is no way to ensure that the electricity provided is from renewable sources only. If this alternative is chosen, it has the potential to affect Headquarters AETC's ability to meet the presidential mandated goals and Air Force directives.

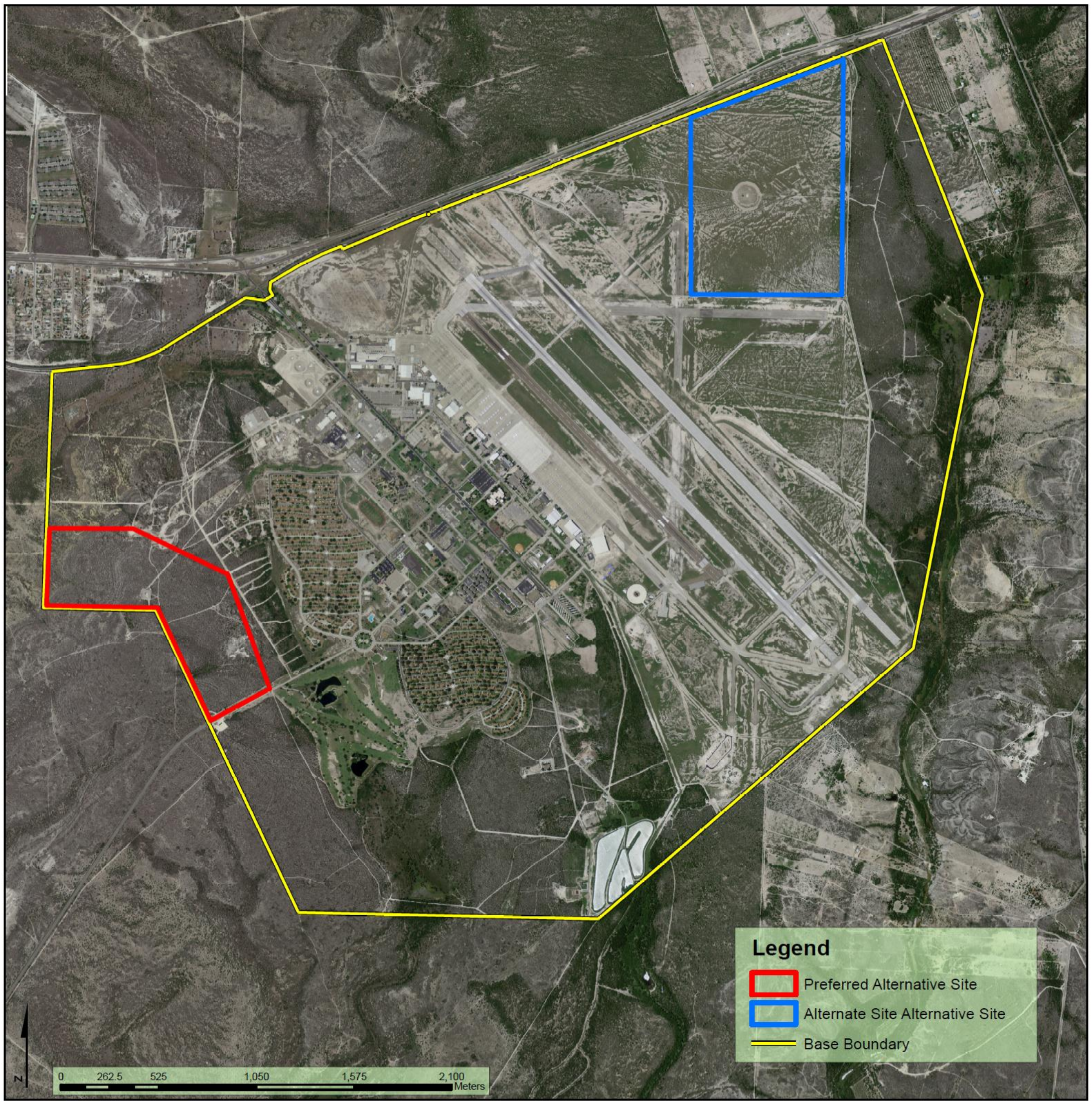

Figure 2-2 Preferred Alternative and Alternate Site Alternative Site Locations

2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER REVIEW

In accordance with the AETC Strategic Energy Vision, the goal is to have all AETC installations achieve 100 percent on-base energy generation by either solar, wind, bio-mass, landfill gas, geothermal, hydroelectric, nuclear means, or wave energy. All of these means of electricity generation were considered, with the exception of wave energy, but it was determined that the only viable means of power generation would be from the construction and operation of a solar array. Electricity generated from wave energy was not considered due to Laughlin AFB being located approximately 250 miles northwest of the Gulf of Mexico. Several factors were utilized to determine the feasibility of the method in which Laughlin AFB would generate its own renewable energy. Factors included were location, space, mission, availability of resources, technology, and time constraints.

Laughlin AFB proper is 4,355 acres and is predominately airfield, support buildings, and housing allowing for limited space for construction of any power generating facilities. The Air Force considered

construction and operation of wind turbines. To provide the 10-MW of power, at least four to six extremely large individual turbines would be required to be constructed and operated, ; For example the widely used General Electric 1.5-MW model, consists of 116-foot long blades atop a 212-foot high tower for a total height of 328 feet. The blades sweep a vertical airspace of just under an acre. Another model being seen more in the United States is the 2-MW Gamesa G87 from Spain, which sports 143-foot long blades (just under 1.5 acres) on a 256-foot tower, totaling 399 feet. Many existing models and new ones being introduced reach well over 400 feet high. Because Laughlin AFB is a pilot training base the use of wind turbines would adversely affect the air installation compatibility use zones (AICUZ) as well as the Digital Airport Surveillance Radar (DASR); thus, this alternative form of renewable energy would not be a practical alternative for Laughlin AFB, and was eliminated from consideration.

To generate electricity from biomass, one must have enough biomass to combust to create steam. To generate 1 MW/h of electricity, a biomass facility must combust 1.25 tons of trash (Energy Recovery Council 2011).The City of Del Rio, Laughlin AFB, and surrounding areas generate 123 tons of municipal solid waste per day and dispose of the waste into the Val Verde County Landfill (Del Rio News-Herald 2009). Based upon this number, utilizing 100 percent of the municipal solid waste to generate electricity, 3.85MW/h would be generated or 33.7 million kilowatt hours (kWh) annually. The average electricity usage by Laughlin AFB is 42.5 million kWh, creating a deficit of 8.8 million kWh. The quantity generated does not meet the quantity required for Laughlin AFB to perform its daily duties and overall mission, therefore biomass is not a viable alternative to electricity generation at Laughlin AFB.

Laughlin AFB currently does not have an active landfill in which landfill gas (methane) could be collected, combined with natural gas and combusted on the installation. Laughlin AFB transports and disposes of its solid waste at the Val Verde County Landfill and whatever electricity generated at that landfill would be generated by Val Verde County and not Laughlin AFB.

The Geothermal Energy Association currently does not recognize Texas as having the potential for electric generation and direct use applications. However, the Texas State Energy Office has located five major regions within the state that they believe have a strong potential for geothermal power production (Erdlac 2007). The identified geothermal reservoirs are located at depths and within small areas. While current technology cannot access this resource, it may be considered viable in the future. Due to time constraints and available technology this method was not considered as an alternative.

Currently there is a hydroelectric plant located 20 miles northwest of Del Rio, on the Rio Grande River at Lake Amistad. Lake Amistad was created at the confluence of the Rio Grande and Devils River by constructing Amistad Dam, home of a hydroelectric plant. The plant has the capacity to generate up to 66MW of electricity and provides power to two electric cooperatives, and cannot specifically provide electricity to Laughlin AFB because there are no Federal transmission lines (U.S. Department of Energy 2003). The Rio Grande and Devils River are the only two water bodies within the area capable of providing the velocity and quantity of water to generate electricity through means of a hydroelectric plant, and since the plant has already been constructed and cannot be solely used for Federal activities hydroelectric electricity generation is not considered to be a viable alternative.

Within the state of Texas, there are currently two operating nuclear power plants; all applications for future plants have been rescinded. Due to recent events, approvals of new nuclear power plants may be delayed and undergo additional reviews. If a new nuclear facility associated with Laughlin AFB was to be constructed it would take at least three years to complete the required reviews before an early site permit issuance could be granted and then additional time would be required to obtain a construction permit. The process to obtain a permit can take over five years, not including the construction of the

facility. With this timeline, the approval for a nuclear facility and construction of one would exceed the timeline set by EO 13514, and is not considered a viable alternative.

2.5 COMPARISON OF ALTERNATIVES

Table 2-1 summarizes the potential effects of the Preferred Alternative and Alternatives on natural and human resources.

Table 2-1
Summary of Potential Effects of the Alternatives

Resource Areas	Alternative A - Preferred Alternative	Alternative B - Alternate Site Alternative	Alternative C - No-Action Alternative
AICUZ	0	—	None
Airspace	0	0	None
Air Quality	—	—	None
Climate	0	0	
Biological Resources			
• Vegetation	—	—	None
• Wildlife	—	—	None
• T&E/Special Concern Species	0	0	None
Cultural Resources	0	0	None
Hazardous Materials			
• Hazardous Materials	0	0	None
• Hazardous Waste	0	0	None
• Solid Waste	—	—	None
• ERP	0	0	None
Land Use	0	0	None
Noise	—	—	None
Safety and Occupational Health	0	0	None
Socioeconomics	+	+	None
Environmental Justice	0	0	None
Utilities/Infrastructure	+	+	None
Water Resources	0	0	None

Notes:

AICUZ –	Air Installation Compatibility Use Zones	+ –	Positive, beneficial impact
T&E –	Threatened and Endangered	0 -	No change
X -	Significant impact	N/A –	Not applicable
— -	Adverse, but not significant impact		

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3.0 AFFECTED ENVIRONMENT

This chapter describes relevant existing environmental conditions at Laughlin AFB for resources potentially affected by the Alternative A – Preferred Alternative and Alternatives as described in Chapter 2.0. In compliance with guidelines contained in NEPA, CEQ regulations, and the requirements of 42 U.S.C. 4321-4347, CEQ Regulations for Implementing the Procedural Provisions of NEPA (40 CFR § 1500-1508), and 32 CFR Part 989, *et seq*., *Environmental Impact Analysis Process* (formerly known as Air Force Instruction [AFI] 32-7061), the description of the existing environment focuses on those environmental resources potentially subject to impacts. These resources and conditions are: Air Quality, Climate, Biological Resources, Cultural Resources, Hazardous Materials/Hazardous Waste/Solid Waste, Land Use, Utilities/Infrastructure, Noise, Socioeconomics/Environmental Justice and the Protection of Children, and Water Resources. The expected geographic scope of potential impacts, known as the region of interest (ROI), is defined for each resource analyzed.

3.1 AIR QUALITY

The United States Environmental Protection Agency (USEPA) has established primary and secondary National Ambient Air Quality Standards (NAAQS) under the *Clean Air Act Amendments of 1990* (CAAA). The CAAA also set emission limits for certain air pollutants from specific sources, set new source performance standards based on best demonstrated technologies, and established national emission standards for hazardous air pollutants.

Federal air quality standards are currently established for six pollutants (known as criteria pollutants): sulfur dioxide (SO_2), carbon monoxide (CO), ozone (O_3), nitrogen dioxide (NO_2), particulate matter ($PM_{2.5}$ and PM_{10}), and lead (Pb). Although O_3 is considered a criteria pollutant and is measurable in the atmosphere, it is often not considered as a pollutant when reporting emissions from specific sources. Ozone is not typically emitted directly from most emissions sources; rather, it is formed in the atmosphere from its precursors (NOx and volatile organic compounds [VOCs]) that are directly emitted from various sources. Thus, emissions of NOx and VOCs are commonly reported instead of O_3. The NAAQS for the six criteria pollutants are shown in Table 3-1.

The USEPA classifies the air quality within an Air Quality Control Region (AQCR) according to whether the region meets federal air quality standards. An AQCR or portion of an AQCR may be classified as attainment, nonattainment, or unclassified with regard to the air quality standards for each of the criteria pollutants. Attainment describes a condition in which standards for one or more of the six pollutants are being met in an area. The area is considered an attainment area for only those criteria pollutants for which the NAAQS are being met. Nonattainment describes a condition in which standards for one or more of the six pollutants are not being met in an area. Unclassified indicates that air quality in the area cannot be classified and the area is treated as attainment. An area may have all three classifications for different criteria pollutants.

The CAAA requires federal actions to conform to any applicable state implementation plan (SIP). The USEPA has promulgated regulations implementing this requirement (USEPA 2003a, 2003b). A SIP must be developed to achieve the NAAQS in nonattainment areas (i.e., areas not currently attaining the NAAQS for any pollutant) or to maintain attainment of the NAAQS in maintenance areas (i.e., areas that were nonattainment areas but are currently attaining that NAAQS). General conformity refers to federal actions other than those conducted according to specified transportation plans (which are subject to the Transportation Conformity Rule). Therefore, the General Conformity Rule applies only to non-transportation actions in nonattainment or maintenance areas.

Table 3-1
National Ambient Air Quality Standards (NAAQS)

Pollutant	Averaging Time	Ambient Air Quality Standard		Violation Criteria
		Parts Per Million By Volume	Micrograms Per Cubic Meter	
Ozone	8 Hours (2008 standard)	0.075	147	If exceeded by the mean of annual 4th highest daily values for a 3-year period
	8 Hours (1997 standard)	0.08	157	If exceeded by the mean of annual 4th highest daily values for a 3-year period
Carbon Monoxide	1 Hour	35	40,000	If exceeded on more than 1 day per year
	8 Hours	9	10,000	If exceeded on more than 1 day per year
Nitrogen Dioxide	1 Hour	0.100	188	If exceeded by the mean of annual 98th percentile of daily max values over 3 years
	Annual Arithmetic Mean	0.053	100	If exceeded
Sulfur Dioxide	1 Hour	0.075	197	If exceeded by the mean of annual 99th percentile of daily max values over 3 years
	3 Hours	0.5	1,300	If exceeded on more than 1 day per year
	24 Hours	0.14	365	If exceeded on more than 1 day per year
	Annual Arithmetic Mean	0.03	80	If exceeded

Table 3-1, Page 1 of 2

Table 3-1
National Ambient Air Quality Standards (NAAQS) (Continued)

Pollutant	Averaging Time	Ambient Air Quality Standard: Parts Per Million By Volume	Ambient Air Quality Standard: Micrograms Per Cubic Meter	Violation Criteria
Inhalable Particulate Matter (PM_{10})	24 Hours	Not Applicable	150	For 1997 non-attainment areas, if exceeded on more than 1 day per year. For other areas, if exceeded by the mean of annual 99th percentile values over 3 years
Fine Particulate Matter ($PM_{2.5}$)	24 Hours	Not Applicable	35	If exceeded by the mean of annual 98th percentile values over 3 years
	Annual Arithmetic Mean	Not Applicable	15	If exceeded as a 3-year spatial average of data from designated stations
Lead	Calendar Quarter	Not Applicable	1.5	If exceeded
	Rolling 3-Month Average	Not Applicable	0.15	If exceeded during a 3-year period

Table 3-1, Page 2 of 2

Notes:

All standards except the national PM_{10} and $PM_{2.5}$ standards are based on measurements corrected to 25 degrees C and 1 atmosphere pressure. The national PM_{10} and $PM_{2.5}$ standards are based on direct flow volume data without correction to standard temperature and pressure. Decimal places shown for the standard reflect the rounding or truncating conventions used for evaluating compliance. The national 1-hour ozone standard has been revoked for all states. The national 8-hour ozone standard was revised from 0.08 ppm to 0.075 ppm effective May 27, 2008.

The 1997 national 8-hour ozone standard of 0.08 ppm remains in place while EPA completes rulemaking actions for the revised national 8-hour standard. EPA is considering possible revisions to the 2008 ozone standard.

The national annual average standard for PM_{10} was rescinded effective December 17, 2006.

The national 24-hour standard for $PM_{2.5}$ was revised from 65 micrograms per cubic meter to 35 micrograms per cubic meter effective December 17, 2006.

The "10" in PM_{10} and the "2.5" in $PM_{2.5}$ are not particle size limits; these numbers identify the particle size class (aerodynamic diameter in microns) collected with 50% mass efficiency by certified sampling equipment. The maximum particle size collected by PM_{10} samplers is about 50 microns. The maximum particle size collected by $PM_{2.5}$ samplers is about 6 microns.

The national 1-hour nitrogen dioxide standard was adopted in February 2010 and became effective in April 2010.

The national 3-month rolling average standard for lead was adopted in November 2008.

The national calendar quarter standard for lead will remain in effect for at least one year after the 3-month rolling average standard takes effect.

The national 1-hour sulfur dioxide standard was adopted in June 2010 and became effective in August 2010.

The national annual average and 24-hour average sulfur dioxide standards will remain in effect for at least one year after nonattainment designations for the 1-hour standard take effect.

Sources:

40 CFR Parts 50, 53, and 58.

U.S. Environmental Protection Agency. 2010. National Ambient Air Quality Standards (NAAQS).

Such actions must perform a determination of conformity with the SIP if the emissions resulting from the action exceed applicability thresholds specified for each pollutant and classification of nonattainment.

Air quality management at Air Force installations is established in AFI 32-7040, *Air Quality Compliance.* AFI 32-7040 requires installations to achieve and maintain compliance with all applicable federal, state, and local standards. Air quality compliance involves prevention, control, abatement, documentation, and reporting of air pollution from stationary sources and mobile sources, if located in nonattainment areas. Maintaining compliance with air quality regulations may require reduction or elimination of pollutant emissions from existing sources and control of new pollution sources.

3.1.1 Hazardous Air Pollutants and Greenhouse Gases

In addition to the six criteria air pollutants covered by federal ambient air quality standards, a large number of compounds have been designated as hazardous air pollutants, which are regulated primarily by emission limits on specific types of industrial emission sources. Greenhouse gases (GHG) are another air pollutant category of general concern. Greenhouse gases are compounds in the atmosphere that absorb infrared radiation and radiate a portion of that radiation toward the earth's surface, thus trapping heat and warming the atmosphere. The most important GHG compounds are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). The overall global warming potential of GHG emissions is typically presented in terms of CO_2 equivalents (CO_2e), using equivalency factors developed by the Intergovernmental Panel on Climate Change.

3.1.2 Regional Air Quality

The ROI for air quality varies according to the type of air pollutant being discussed. Primary pollutants, such as CO and directly emitted particulate matter, have a localized region of effects generally restricted to the immediate vicinity of the source of emissions. Secondary pollutants, such as O_3 and CO_2, have a broader region of effects.

Laughlin AFB is located in Val Verde County and is within the Metropolitan San Antonio Interstate Air Quality Control Region (AQCR) 217. AQCR 217 consists of the counties of Atascosa, Bandera, Bexar, Comal, Dimmitt, Edwards, Frio, Gillespie, Gonzales, Guadalupe, Kames, Kendall, Kerr, Kimble, Kinney, La Salle, Mason, Maverick, Medina, Real, Uvalde, Val Verde, Wilson, and Zavala. Val Verde County is currently classified as attainment for all criteria pollutants under the NAAQS (USEPA 2010b). Laughlin AFB, considered to be a synthetic minor emission source, has one minor source operating permit for a corrosion control facility and maintains permits by rule for their remaining stationary emission sources. Table 3-2 compares the 2008 actual and permitted emissions for Laughlin AFB with the 2008 Val Verde County air emissions inventory. Val Verde County emissions include emissions from point, area, non-road mobile, and on-road mobile sources. Laughlin AFB emissions include stationary sources such as boilers, generators, surface coatings, paint booths, storage tanks, and fueling operations, among others. Mobile and biogenic source emission inventories have not been determined for Laughlin AFB.

Table 3-2
Significant Air Emissions – Permit Limits versus Actual (tons per year)

	$PM_{2.5}$	PM_{10}	SO_2	NO_x	VOC	CO	Pb
Val Verde County[1]	460	3,390	128	2,794	25.2	9,795	N/A
Permit 34801	23.6	23.6	10	45	94	99.5	
Laughlin AFB Actual[2]	3.36	3.36	0.61	7.74	12.67	16.83	0.02

Notes: 1 – AIRData comes from an extract of USEPA's National Emission Inventory (NEI) Database; although the report is listed as 2008, data was collected from 2002 sources.
2 – 2008 Laughlin AFB Air Emission Inventory
CO – carbon monoxide
Pb – Lead
PM_{10} – particulate matter less than 10 microns in diameter
$PM_{2.5}$– particulate matter less than 2.5 microns in diameter
SO_2 – sulfur dioxide
N/A – No data available
NO_x – nitrogen oxides
VOC – volatile organic compounds

Sources: USEPA 2008a, b; Air Force 2007c

3.1.2.1 Air Quality Conditions

The USEPA evaluates whether the criteria air pollutant levels within a geographic area meet national ambient air quality standards. Areas that violate air quality standards are designated as nonattainment areas for the relevant pollutants. Nonattainment areas are sometimes further classified by degree (marginal, moderate, serious, severe, and extreme). Areas that comply with air quality standards are designated as attainment areas for the relevant pollutants. Areas that have been re-designated from nonattainment to attainment are designated as maintenance areas. Areas of uncertain status are generally designated as unclassifiable and are treated as attainment areas.

3.1.2.2 Clean Air Act Conformity Guidelines

Section 176(c) of the federal CAA contains requirements that apply specifically to federal agency actions, including actions receiving federal funding. This section of the CAA requires federal agencies to ensure that their actions are consistent with the CAA and with applicable state air quality management plans. Federal agencies are required to evaluate their proposed actions to make sure that they will not cause or contribute to new violations of any federal ambient air quality standards; that they will not increase the frequency or severity of any existing violations of federal ambient air quality standards; and that they will not delay the timely attainment of federal ambient air quality standards.

The USEPA general conformity rule requires a formal conformity determination document for federally sponsored or funded actions in nonattainment or maintenance areas when the net increase in direct and indirect emissions of nonattainment or maintenance pollutants exceeds specified *de minimis* thresholds. Val Verde County is not located within a nonattainment or maintenance area, so any federally sponsored or funded actions would not require a formal conformity determination.

3.2 CLIMATE

Val Verde County has a semi-arid, continental climate with dry winters and hot summers. Temperatures over 100 degrees Fahrenheit (°F) are not uncommon in the summer, and weeks or months without measurable precipitation are typical. Prevailing winds are southeasterly from April through October. From November through March, northeasterly winds prevail, bringing more abrupt day-to-day changes in temperature. Average wind speed is highest in July at 11.6 miles per hour. In winter, the average temperature is 53°F, with an average daily minimum of 40°F. The lowest temperature on record (8°F) occurred in January 1962. Cold periods in winter are characterized by strong, dry, dusty northerly and northeasterly winds that may cause temperatures to drop as much as 25°F in a few hours. These extremely cold periods usually do not last more than two or three days. Temperatures below freezing occur on an average of 19 days per year. Although freezing temperatures have been recorded as early as October and as late as March, the average earliest and latest freeze dates are 9 December and 12 February, respectively. The average daily maximum temperature in summer is 98°F, with a record high of 111°F in July 1960. Hot weather is rather persistent from late May to mid-September, although temperatures above 100°F have been recorded as early as March and as late as October. Average annual rainfall is 18.38 inches. Approximately two-thirds of this falls April through October. The heaviest one-day rainfall on record is 8.8 inches in Del Rio (June 1935). Thunderstorms occur about 34 days each year and have occurred in all months of the year. Yearly rainfall has ranged from 37.75 inches in 1914 to 4.34 inches in 1956. The largest monthly rainfall, 13.71 inches, occurred in June 1935. Rainfall comes chiefly in showers that are frequently associated with local thunderstorms and characterized by heavy downpours. Hail occurs in Val Verde County about once a year and reaches severe proportions about once in five years. Sleet or snow falls an average of once per year but frequently melts as it falls; only about once in four or five years does a snowfall occur that is heavy enough to blanket the ground. The heaviest one-day snowfall on record was January 1985. The average relative humidity in mid-afternoon is about 54 percent while the humidity is higher at night; the average humidity at dawn is about 79 percent. The proportion of possible sunshine is 80 percent in summer and 53 percent in winter (Air Force 2007c). Figure 3-1 shows the PV resources expected on an annual basis for the U.S. Laughlin AFB, Texas would be expected to have an average annual capability (insolation) to produce between 5 and 6.5 $KWh/m^2/day$ (National Renewable Energy Laboratory [NREL] 2008). If a tracking array were installed, the annual insolation rate could be between 6.2 and 7.4 kilowatt hours per square meter per day ($KWh/m^2/day$) (Appendix C).

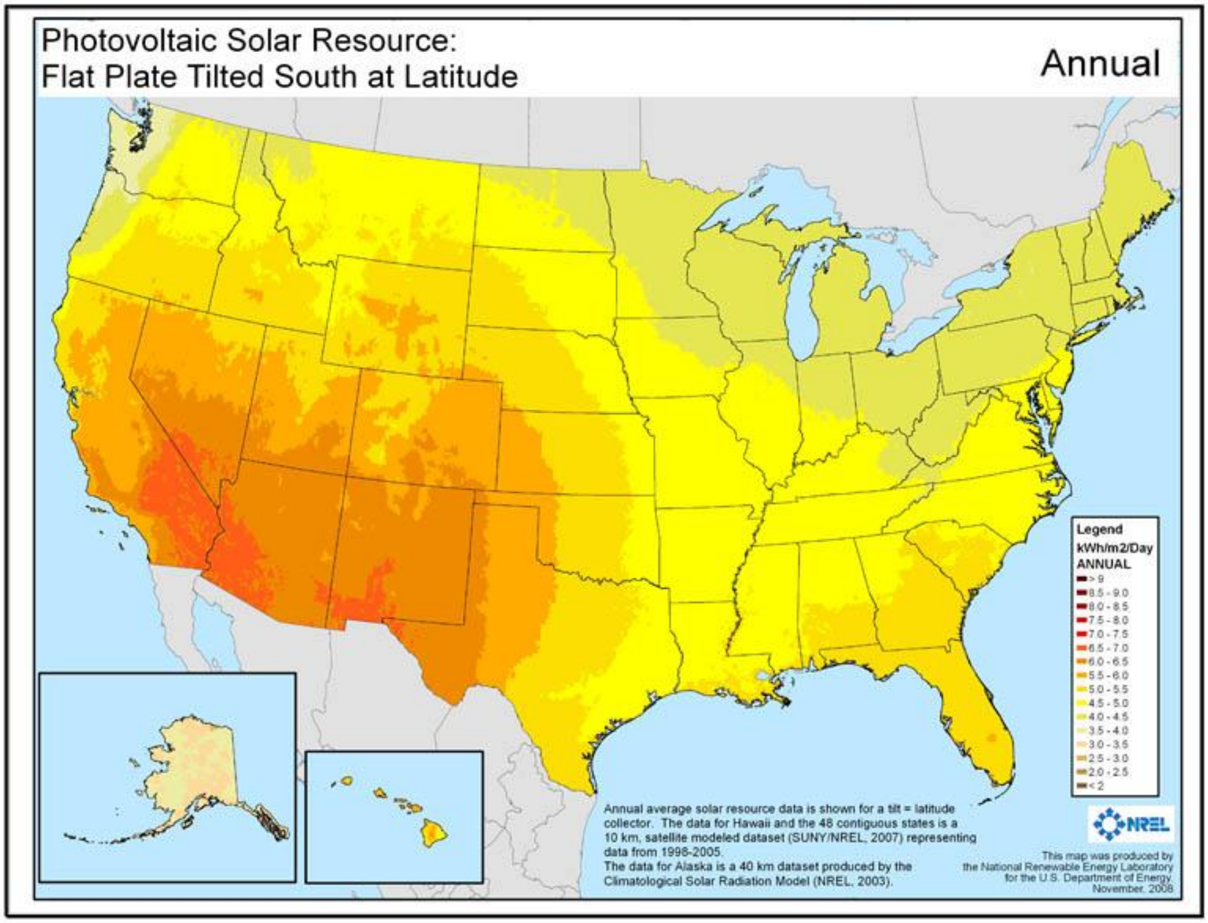


Figure 3-1 Annual Average Solar Resource for the United States for a Flat Plane Collector Tilted South

3.3 BIOLOGICAL RESOURCES

Biological resources include living, native, or naturalized plant and animal species and the habitats in which they occur. The natural resources at Laughlin AFB are managed under an Integrated Natural Resources Management Plan (INRMP) (Air Force 2006). For the purposes of this analysis, biological resources are divided into the categories of vegetative communities; wildlife including mammals and bird species; and threatened, endangered, or state listed species of concern. The United States Fish and Wildlife Service (USFWS) is responsible for the recovery of federally listed threatened and endangered species under the *Endangered Species Act of 1973.* The Texas Parks and Wildlife Department (TPWD) provides management for wildlife at the state level.

3.3.1 Vegetation

Val Verde County lies within the western portion of the Edwards Plateau eco-region of Texas. The Balcones Escarpment forms a distinct boundary of the Plateau on its eastern and southern borders and outlines what is known as the Texas Hill Country (TPWD 2005). The eastern and southern halves of the Plateau consist of dense growth of shrubs and small trees, mostly oaks *(Quercus fusiformis* and other species) and Juniper *(Juniperus ashei).* Within the northwestern margin the vegetation grades into a short Tobosa Grass *(Hilaria mutica)* savanna with Mesquite *(Prosopis glandulosa)* (Johnston 2006).

Vegetation found on Laughlin AFB is consistent to that within the eco-region described above. Vegetation communities are described in terms of a "series" which identifies one or more dominant plant. A biological survey of the base found four distinct vegetation areas: Cane Bluestem-False Rhodesgrass Series, Cenizo Series-Guajillo Series mosaic, the Sugarberry-Elm Series, and the Big Sacaton Series (TPWD 1995). Degraded remnants of the Cane Bluestem-False Rhodesgrass Series are found in the level uplands on the east side of the base as well as some scattered patches. These sites are heavily mowed to prevent shrub invasion. These grasslands have been heavily invaded by or planted with grasses such as Bermuda *(Cynodon dactylon)*, King Ranch bluestem *(Bothriochloa ischaemum* var. *songarica)*, and St. Augustine *(Stenotaphrum secundatum)* (TPWD 1995). Cenizo Series-Guajillo Series mosaic covers the hills of the western half, and eastern edge of the base. Heavy grazing and the suppression of fires have resulted in the proliferation of woody species such as cenizo *(Leucophyllum frutescens)*, guajillo *(Acacia berlandieri)*, and numerous other species in this habitat (TPWD 1995).

The Sugarberry-Elm Series occupies relatively level to gently sloping terrain. The overstory is dominated by trees such as sugarberry *(Celtis laevigata)*, cedar elm *(Ulmus crassifolia)*, netleaf hackberry *(Celtis reticulata)*, black willow *(Salix nigra)*, and Berlandier ash *(Fraxinus berlandieri)*. The herbaceous ground cover consists of various grasses and forbs (TPWD 1995). The Big Sacaton Series occupies relatively level, seasonally wet bottomlands adjacent to Sacatosa Creek. Ground cover consists of spikesedge *(Eleocharis* sp.) and Aparejo muhly *(Muhlenbergia utilis)* covered by a taller layer of Lindheimer muhly *(Muhlenbergia lindheimeri)*, big alkali sacaton *(Sporobolus wrightii)*, and switchgrass *(Panicum virgatum)* (TPWD 1995).

3.3.2 Wildlife

Wildlife at Laughlin AFB is consistent with those expected to occur in the scrub-shrub and grassland vegetative communities described above. Common species observed on the installation include Desert Cottontail *(Sylvilagus audobonii)*, Black-tailed Jack Rabbit *(Lepus californicus)*, Mexican Ground Squirrel *(Spermophilus mexicanus)*, Turkey Vulture *(Cathartes aura)*, Red-tailed Hawk *(Buteo jamaicensis)*, Rock Dove *(Columba livia)*, Mourning Dove *(Zenaida macroura)*, Chihuahuan Raven *(Corvus cryptoleucus)*, and Cactus Wren *(Campylohychus brunneicapillus)*.

Popular wildlife game species at Laughlin AFB include white-tailed and desert mule deer, turkey, javelina, bobwhite and scaled quail, and white-winged and mourning dove. Other wildlife includes bobcat, coyote, puma (mountain lion), gray and red fox, raccoon, opossum, ringtail, porcupine, armadillo, cottontail rabbit, jackrabbit, skunk, fox squirrel, beaver, badger, and several species of bats. Some of these species occur throughout the county while others, such as raccoon, opossum, and squirrel are found mainly around rivers and creeks.

3.3.3 Threatened, Endangered, and Rare Species in Val Verde County

According to the Annotated County Lists of Rare Species published by the TPWD, there are 66 different species identified as rare species for Val Verde County (TPWD 2010). These include 2 species of amphibians, 16 species of birds, 1 species of crustacean, 14 species of fish, 5 species of insects, 1 species of mammals, 4 species of mollusks, 7 species of reptiles, and 16 species of plants. Two rare plant species identified on the TPWD list; Longstalk Heimia *(Heimia longipes)* and Texas Trumpet *(Acleisanthes crassifolia)* were found on the installation. The Longstalk Heimia is known to occur in five locations on Laughlin AFB, in the floodplain areas along Sacatosa Creek on the eastern edge of the base and in the floodplain of the unnamed southwest drainage along the southern perimeter road west of the sewage ponds (Air Force 2006). A small population of Texas Trumpets was found in a shrubland on a gravelly slope in the northwest quarter of the installation near the western perimeter fence (Air Force 2006).

3.3.3.1 Federally Listed Species in Val Verde County

Val Verde County has three federally listed birds, one fish, one mollusk, and two flowering plant species (Table 3-3) on the USFWS Endangered Species list. A biological survey of Laughlin AFB (TPWD 1995) did not find any of these species on the base. A threatened and endangered species habitat assessment of Laughlin AFB was conducted in April 2011 to determine if any of these species are currently present on the base or if habitat is likely to occur on the base. During the survey, one Black-capped Vireo was observed north of the wastewater treatment ponds at three separate locations, see Figure 3-2. It is believed that the Black-capped Vireo is a late migrant and not a resident. After the survey was completed, a subsequent survey was conducted to specifically verify the resident status of the Black-capped Vireo. During the survey the bird was not observed (visually or auditory) so it is assumed that the bird was a late migrant and not a resident.

Table 3-3
Federally Listed Species in Val Verde County

Common Name	Scientific Name	Status[1]
Birds		
Black-capped Vireo	*Vireo atricapilla*	E
Brown pelican	*Pelecanus occidentalis*	DM
Interior least tern	*Sterna antillarum athalassos*	E
Mollusks		
Texas hornshell (mussell)	*Popenaias opeii*	C
Fish		
Devils River minnow	*Dionda diaboli*	T
Plants		
Texas snowbells	*Styrax texanus*	E
Tobusch fishhook cactus	*Ancistrocactus tobuschii*	E

Note: C – Candidate Taxon, Ready for Proposal;
DM – Delisted Taxon, Recovered, Being Monitored First Five Years
E – Endangered
T – Threatened
Source: USFWS 2010

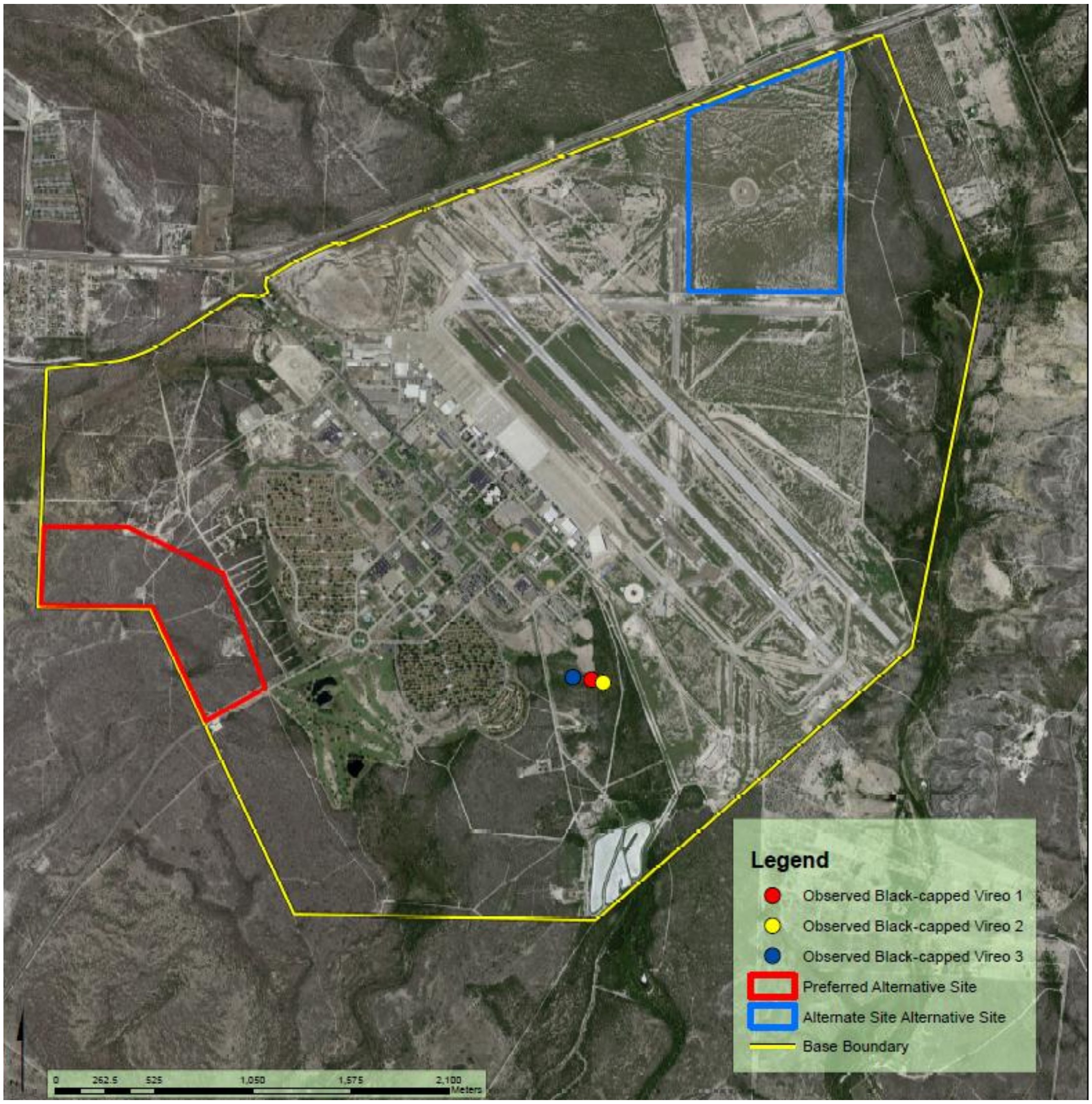


Figure 3-2 Location of Black-capped Vireo Observations During April 2011 Survey

3.3.3.2 State Listed Species in Val Verde County

Table 3-4 identifies the state listed threatened or endangered species found in Val Verde County. Four threatened bird species have been identified as occurring in Val Verde County. The golden-cheeked warbler *(Dendroica chrysoparia)* may migrate through the area, although it has not been confirmed as a nesting resident of the county. Habitat at Laughlin AFB does not appear appropriate for nesting populations of these species. Four rare species have been known to exist at Laughlin AFB and are under consideration for special status. These are the Loggerhead Shrike *(Lanius ludovivianus)*, the Mexican Hooded Oriole *(Icterus cucullatus cucullatus)*, the Audubon's Oriole *(Icterus graduacauda audubonnii)*, and the Olive Sparrow *(Arremonops rufivigatus)*. The Loggerhead Shrike, Mexican Hooded Oriole, and Olive Sparrow were observed to be nesting during surveys conducted in May 1993; however, during the April 2011 survey, only the Olive Sparrow was observed. The Audubon's Oriole has not been observed at Laughlin AFB during the two surveys conducted (TPWD 1995).

Table 3-4
State Listed Species in Val Verde County

Common Name	Scientific Name	Status
Birds		
American peregrine falcon	*Falco peregrines anatum*	Threatened
Black-capped Vireo	*Vireo atricapilla*	Endangered
Common Black-hawk	*Buteogallus anthracinus*	Threatened
Interior least tern	*Sterna antillarum athalassos*	Endangered
Peregrine falcon	*Falco peregrines*	Threatened
Zone-tailed hawk	*Buteo albonotatus*	Threatened
Fish		
Blotched gambusia	*Gambusia senilis*	Threatened
Blue sucker	*Cycleptus elongates*	Threatened
Conchos pupfish	*Cyprinodon eximius*	Threatened
Devils River minnow	*Dionda diaboli*	Threatened
Pecos pupfish	*Cyprinodon pecosensis*	Threatened
Proserpine shiner	*Cyprinella Proserpina*	Threatened
Rio Grande darter	*Etheostoma graham*	Threatened
Rio Grande silver minnow	*Hybognathus amarus*	Endangered
San Felipe gambusia	*Gambusia clarkhubbsi*	Threatened
Mammals		
Black bear	*Ursus americanus*	Threatened
Gray wolf	*Canis lupus*	Endangered
Ocelot	*Leopardus paradalis*	Endangered
White nosed coati	*Nasua narica*	Threatened
Mollusks		
False spike mussel	*Quadrula mitchelli*	Threatened
Mexican fawnsfoot mussel	*Truncilla cognate*	Threatened
Salina mucket	*Potamilus metnecktayi*	Threatened
Texas hornshell (mussell)	*Popenaias opeii*	Endangered
Reptiles		
Reticulate collared lizard	*Crotaphytus reticulates*	Threatened
Texas horned lizard	*Phrynosoma cornutum*	Threatened
Texas indigo snake	*Drymarchon melanurus erebennus*	Threatened
Texas tortoise	*Gopherus berlandieri*	Threatened
Trans-Pecos black-headed snake	*Tantilla cucullata*	Threatened
Plants		
Texas snowbells	*Styrax texanus*	Endangered
Tobusch fishhook cactus	*Ancistrocactus tobuschii*	Endangered

Source: TPWD 2010

The Texas horned lizard *(Phrynosoma cornutum)* is a State threatened species which is not currently being considered for Federal listing. Texas horned lizard populations were documented on base during the May 1993 survey but not during the April 2011 survey. The prominent population was observed in the northeastern portion of the base in the Chihuahuan desert scrub.

Two other State-listed threatened reptiles, the Indigo snake *(Drymarchon corais)* and the Texas tortoise *(Gopherus berlandieri)* have been identified as occurring in Val Verde County. Both of these species require scrub habitat that may be present across Laughlin AFB. Unconfirmed reports of possible Indigo snakes on base have been documented but were not observed during the April 2011 survey.

3.4 CULTURAL RESOURCES

The project area lies within the Lower Pecos Canyonlands archaeological subregion. The Lower Pecos Canyonlands has been one of the more intensively studied regions in Texas, primarily because of the construction of Amistad Reservoir. The deep canyons of the Rio Grande, Pecos, and Devils Rivers are characterized by numerous rock shelters, which were used by the prehistoric human populations in the region for shelter. Deposits in these shelters are often marked by extremely good preservation of perishable artifacts such as baskets, cordage, leather, nets, sandals, wooden tools and utensils. The area is also noted for its polychrome rock art. Numerous open-air sites are also present, including deeply stratified campsites.

The historic period began with the arrival of Spanish Europeans in the 1500s. Environmental alterations from European / Euro American land use have drastically modified the native setting. These alterations have affected the distribution of flora and fauna species as well as the adaptive strategies utilized by Native Americans and Euro-Americans during the historic period.

A comprehensive assessment of archaeological/cultural resources at Laughlin AFB was conducted in October 2004. The survey examined 13 sites, including 11 prehistoric sites, 1 historic site, and 1 site with both historic and prehistoric components. Of the 13 archaeological sites noted in the survey, 11 sites were recommended as significant and potentially eligible for inclusion to the National Register for Historic Places (NRHP). These 11 sites were 41VV1653, 41VV1654, 41VV1655, 41VV1683, 41VV1685, 41VV1686, 41VV1687, 41VV1688, 41VV1689, 41VV1690, and 41VV1691. However, subsequent formal evaluations of these sites by Texas A&M University (TAMU) (*Dering 1998*) resulted in only four sites actually being determined eligible for inclusion to the NRHP: 41VV1654, 41VV1688, 41VV1689 and 41VV1690. One of the archaeological fossil sites is located more than 500 feet from the northern boundary of Preferred Alternative Site. The entrance to the fossil beds site is shown in Figure 3-3. The fossil beds are also separated from Preferred Alternative Site by Arkansas Road, an unpaved road that is primarily used by security forces personnel to maintain the integrity of the bases' perimeter. One site identified in 1994, 41VV1682, is located within the Alternate Site Alternative boundary. The site is suggested to be post a 19th century building associated with the Zacatosa Ranch, and has the potential to be listed as a State Archaeological Landmark and/or on the National Register of Historic Places.

An inventory of Cold War era facilities was completed in May 2002. No buildings were documented as being of any historical significance.

Detailed information on the cultural, historical, and archaeological resources at Laughlin AFB are recorded in the Laughlin AFB *Integrated Cultural Resources Management Plan* completed in 2004 (Air Force 2004).

3.4.1 Native American Issues

In 1999, the DoD promulgated its *American Indian and Alaska Native Policy,* which emphasizes the importance of respecting and consulting with tribal governments on a government-to-government basis. The policy requires an assessment, thorough consultation of the effect of proposed DoD actions that may have the potential to significantly affect protected tribal resources, tribal rights, and Indian lands before

decisions are made by the services. Native American issues at Laughlin AFB would likely relate to Traditional Cultural Properties (TCPs) or sacred sites. A TCP is defined generally as a historic property that is eligible for inclusion in the NRHP because of its association with cultural practices or beliefs of a living community that (a) are rooted in the community's history; and (b) are important in maintaining the continuing cultural identity of the community. The community may entail a Native American tribe, a local ethnic group, or the people of the nation as a whole. To date, no TCPs or sacred sites have been identified at Laughlin AFB. Their presence will largely be determined by consultation with Native American groups that may have attached cultural values to landscape features. Consultations with these tribes would establish not only whether or not TCPs might be located on the site, but also if there are any sacred sites.

Figure 3-3 Archaeological Fossil Beds Site North of Preferred Alternative

3.5 GEOLOGY AND SOILS

Laughlin AFB lies at the junction of two major physiographic regions of Texas: the Edwards Plateau and the Rio Grande Plain. The Edwards Plateau is part of the Great Plains and the Rio Grande Plain is part of the Gulf Coastal Plains. The approximate divide for these two physiographic provinces is U.S. Highway 90. Running generally north of a line formed by U.S. Highway 90, the Edwards Plateau region is locally characterized by high dry limestone ridges, scrub brush, and poor surface soils. South of Highway 90, the Rio Grande Plains generally has gently rolling plains and somewhat deeper and richer soils. The vegetation around Laughlin AFB is characterized by brush, mesquite, cat claw acacia, huisache, grarijeno, retema, prickly pear, and large areas of native grass. Laughlin AFB lies predominantly in the Rio Grande Plain, which is a subdivision of the Rio Grande physiographic province. The base lies near the edge of the Balcones Fault Zone, but there has been no recent seismic activity in the area (Air Force 2007c).

Laughlin AFB is underlain by the Uvalde Gravel of Pliocene or Pleistocene Age. The Uvalde Gravel is composed of caliche-cemented gravel, some boulders up to one foot in diameter, well-rounded cobbles of cherts and some cobbles of quartz, limestone, and igneous rocks. The westernmost portion of the base has exposed areas of the upper cretaceous Buda limestone and Del Rio Clay. The Buda Limestone consists of fine grained, bioclastic, commonly glauconitic, pyritiferous, hard, massive, poorly bedded material grading to nodular, thinner bedded argillaceous near upper contact, light gray to pale orange; weathers dark gray to brown. The Del Rio clay is composed of calcareous and gypsiferous becoming less calcareous and more gypsiferous upward. Pyrite is common with a blocky overall texture. It is medium gray and weathers to light gray.

Minerals with significant deposits in Val Verde County include oil, natural gas, and manganese. The oil in the area is asphaltic and is generally not economical to drill. There are some small natural gas deposits being tapped in the northwest part of the county. Manganese was mined near Shumla during World War I, but the quality of the ore was not sufficient to allow economical operation of the mines after the war ended. No active pits, quarries, mines, or oil or gas wells are known to exist at Laughlin AFB.

The predominant soil type on base is the Zapata-Vinegarroon (ZaC) complex. This soil is characterized by very shallow gently sloping soils on upland areas. These soils formed in old outwash sediment over thick beds of caliche. As much as 20 percent of the surface is covered by limestone and caliche fragments. These soils are well drained. Surface runoff is medium. Permeability is moderate, and available water capacity is very low. There are lesser areas of Acuna silty clay (AcB). This soil type is found in stream terraces and streambeds.

3.6 HAZARDOUS MATERIALS/HAZARDOUS WASTE/SOLID WASTE

3.6.1 Hazardous Materials

Hazardous material use and management at Laughlin AFB are regulated under the Toxic Substance Control Act (TSCA), Occupational Safety and Health Administration (OSHA), Emergency Planning and Community Right-to-Know Act (EPCRA), and Air Force Occupational Safety and Health Standards. The regulations require personnel using hazardous materials to be trained in the application, management, handling, and storage of material; know the location of material safety data sheets (MSDSs) for all hazardous materials that they are using; and wear the correct personal protective equipment (PPE) required for materials that are being used. Laughlin AFB has a Prevention Management Action Plan in place that documents management, measurement, and reporting goals in relation to hazardous materials located on Laughlin AFB and all associated property. Current operations at Laughlin AFB and associated property require the use of hazardous materials in varying quantities. Hazardous materials are used by military personnel and on-base contractors throughout the base. The location of hazardous materials, procedures and equipment at Laughlin AFB used to prevent and clean up a release, and actions to be taken in the event of a release are located in the *Laughlin AFB Spill Prevention, Control, and Countermeasures Plan* (Air Force 2007d).

3.6.2 Hazardous Waste

Hazardous waste generated at Laughlin AFB include: non-hazardous waste that cannot be disposed of in landfills (such as used oil and spent antifreeze); hazardous waste as defined under federal and state regulations; and universal wastes that, due to commonality of generation and high potential for recycling, are subject to slightly less stringent regulatory requirements than other hazardous waste. Additionally, there are several collection areas maintained for non-Resource Conservation and Recovery Act (RCRA)

regulated absorbent materials contaminated with petroleum, oils, and lubricants (POLs). These materials are also disposed through the Defense Reutilization Marketing Service (DRMS).

Laughlin AFB is a Large Quantity Generator of Hazardous Waste. Laughlin AFB has reduced hazardous waste generation from a high of 64,067 pounds in 2001 to 38,346 pounds in 2005.

3.6.3 Solid Waste

The solid waste, including municipal solid waste (MSW) and industrial solid waste (ISW) is managed through the Laughlin AFB Solid Waste Management Plan. MSW/ISW disposal and recycling of aluminum cans, bond paper, newspaper, and baled cardboard, are performed under local contract. Waste disposal is in the Del Rio County Landfill. The landfill currently disposes of approximately 45,000 tons of waste annually (Del Rio News-Herald 2009). Some recyclable items, including computers and furniture, and scrap metal other than aluminum cans, are managed through the Defense Reutilization and Marketing Service.

The recycling program includes materials for which a market exists in Texas and Mexico. The materials separated from MSW/ISW for recycling include:

- Metals (sorted into several categories per DRMS guidance) and aluminum cans;
- High quality paper; newspaper; cardboard (shipping boxes are baled for collection);
- Lead/acid batteries (most of which are returned to the supplier in lieu of core charges); and
- Used oil (picked up as a non-hazardous waste by DRMS).

Tires are turned in to tire suppliers in lieu of core charges by the personnel responsible for maintenance of the specific vehicle. Additionally, laser printer and copier toner cartridges are turned in for recycling from all workcenters that use them. Bond paper and printer toner cartridges are found in virtually every workcenter. Spent fluorescent light tubes and non-lead/acid batteries, which are managed and disposed of through the DRMS as “universal waste,” are also ultimately recycled.

3.6.4 Environmental Restoration Program

The Environmental Restoration Program (ERP), formerly known as the Installation Restoration Program, was implemented by the DoD to identify and evaluate areas and constituents of concern of toxic and hazardous material disposal and spill sites. Once the areas and constituents had been identified, the ERP was tasked to remove the hazards in an environmentally responsible manner. All response actions are based upon provisions of the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA), and the *Superfund Amendments and Reauthorization Act of* 1986 as clarified in 1991 by EO 12580, *Superfund Implementation*. Laughlin AFB has a total of 20 ERP sites and 4 areas of concern (AOCs). Currently, 12 of the ERP sites are closed or pending closure with no further action required (Air Force 2007c).

Congress established the Military Munitions Response Program (MMRP) under the Defense Environmental Restoration Program (DERP) to address unexploded ordnance (UXO), discarded military munitions (DMM) and munitions constituents (MC) located on current and former defense sites. MMRP-eligible sites include sites other than operation ranges where UXO, DMM, or MC are known or suspected and the release occurred prior to 30 September 2002. Properties classified as operational military ranges, permitted munitions disposal facilities, or operating munitions storage facilities are not eligible for the

MMRP. Three open MMRP, one closed MMRP, one open IRP site, and two closed IRP sites are located within 0.5 mile of the Alternative A – Preferred Alternative. Two open MMRP sites, a former skeet range and former pistol range are located to the northeast and east of Preferred Alternative site (Figure 3-4). One open MMRP site, a former grenade practice range, is located to the west of Alternate Site Alternative site and an open IRP site with an unknown source type is located to the south (Figure 3-5).

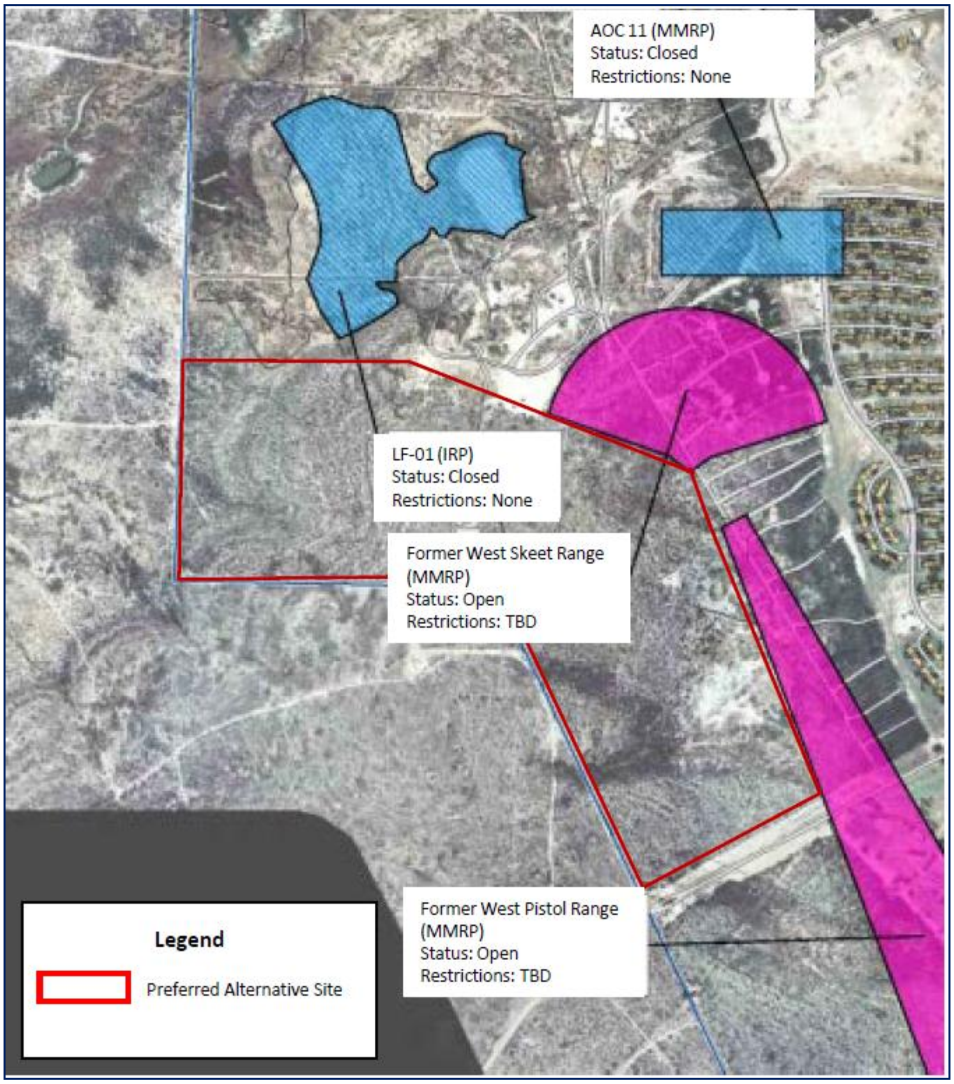


Figure 3-4 ERP Sites Located Close to the Preferred Alternative Site

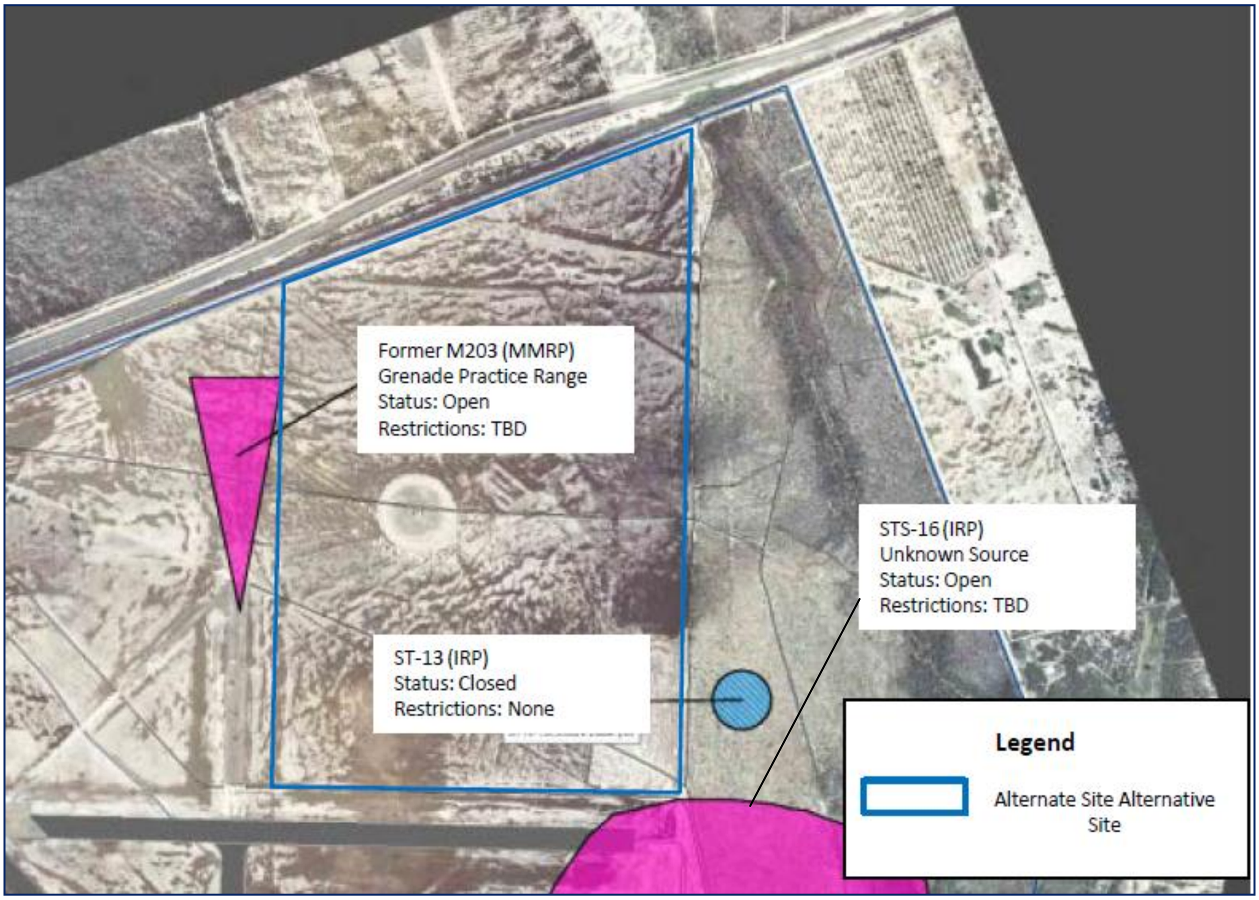


Figure 3-5 ERP Sites Located Close to the Alternate Site Alternative Site

3.7 LAND USE

Land use at Laughlin AFB is shown in Table 3-5. The majority of the land includes semi-improved land used for the airfield and flight operations. Approximately 39 percent of the land on the installation is unimproved.

The City of Del Rio has a comprehensive zoning ordinance; however, it does not extend beyond the city limits. The eastern portion of the city extends along U.S. Highway 90 and lies within either a residential or commercial zoning district. Under Texas law, counties do not exercise land use control. Recognizing that airports and airfields often lie outside of municipalities, the state of Texas does authorize a special purpose jurisdiction, a Joint Airport Zoning Board that does have the authority to regulate land uses for the purposes of airport compatibility. This zoning is contained in the Laughlin Air Force Base Compatible Land Use and Hazard Zoning Ordinance, adopted by the Del Rio-Val Verde County Joint Airport Zoning Board. This ordinance was prepared in accordance with the State of Texas Airport Zoning Act to address the area of influence derived from a previous 1994 AICUZ Study. The ordinance establishes a controlled area that extends five miles from the ends of the runway paved surfaces (along the extended runway centerline) and one and one-half miles outward from the centerline of each runway. Within this area, development is regulated to ensure its compatibility with the accident potential and noise generated by aircraft operations at Laughlin AFB. Land uses within the controlled area are regulated by type and density, and noise level reduction requirements are established for future development within noise zones.

Table 3-5
Resource Area Table

Resource Area	Acres
Improved Grounds - all maintained by service contract	
Base administration areas	377
Athletic fields and parade ground	8
MFH during vacancies	1
Golf course maintained by Non-Appropriated	92
Greens (82,473 sq. ft.)	2
Tees (43,900 sq. ft.)	1
Family housing lawns mowed by occupants	109
Base Civil Engineer (BCE), base	1
Total improved grounds	**591**
Semi-Improved Grounds - all maintained by service	
Airfield, base	1,296
Others, base	262
Spofford AAF	402
Total semi-improved grounds	**1,960**
Unimproved Grounds	
Grazing out leases	0
Acres of other unimproved grounds	1,619
Spofford Easement	148
Wetlands	5
Total acres of unimproved grounds	**1,772**
Land under facilities (buildings, roads, parking)	432
Total acres of installation lands	**4,755**

Source: Air Force 2006

3.8 NOISE

Sound travels through the air as waves of minute air pressures fluctuations caused by vibration. Sound level meters measure pressure fluctuations from sound waves, with separate measurements made for different sound frequency ranges. These measurements are reported in a logarithmic decibel (dB) scale. Because the human ear is not equally sensitive to all frequencies, the "A-weighted" decibel scale (dBA) is used to weight the meter's response to approximate that of the human ear. Average noise exposure over a 24-hour period often is presented as a day-night average noise level (Ldn). Ldn values are calculated from 24-hour averages in which nighttime values (10:00 PM to 7:00 AM) are increased 10 dB to account for the greater disturbance potential from nighttime noises.

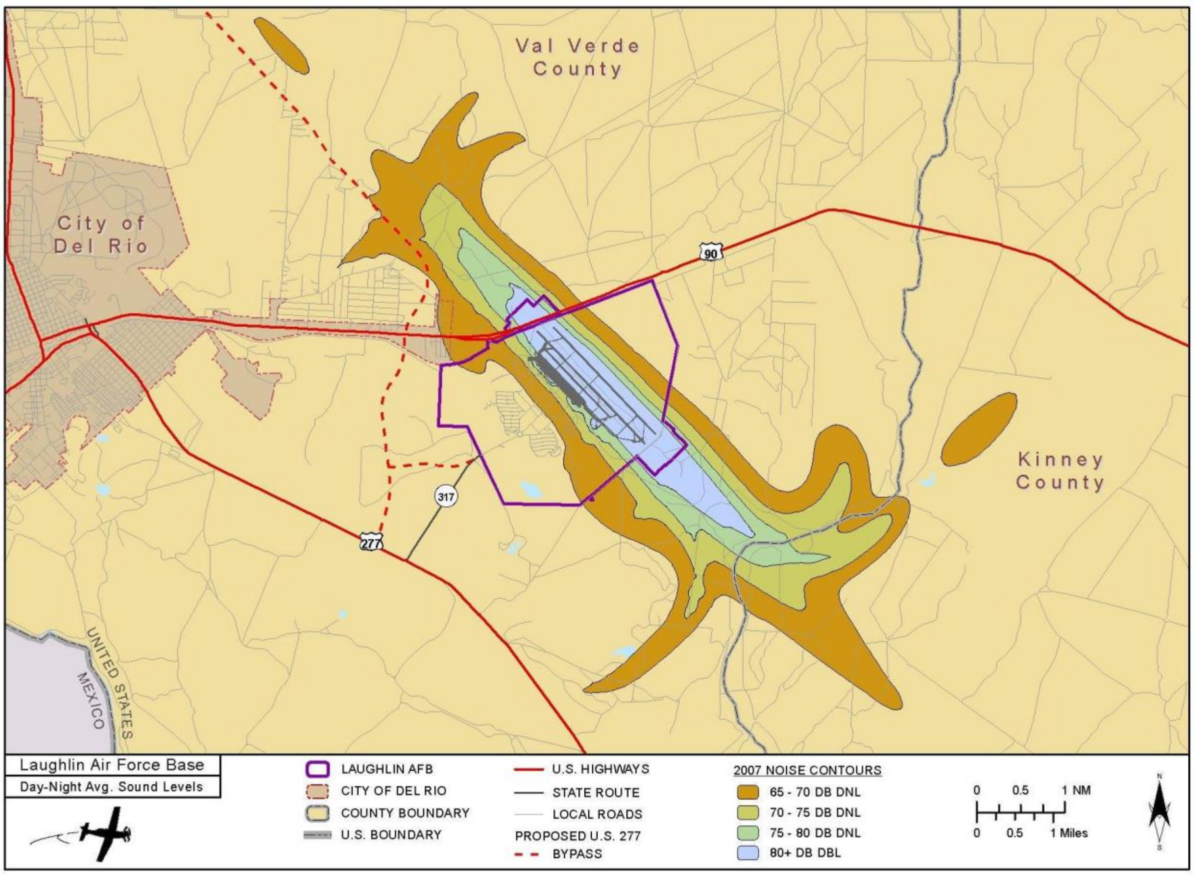
Example noise levels include the following: military aircraft at 500 feet is 100 dB, a heavy truck at 50 feet is 80 dB, military aircraft at 10,000 feet is 70 dB, rural daytime outdoors is 40 dB, and a bedroom at night is 40 dB. Relative to human receptors, noise levels under 40 dBA are considered quiet, 46 to 65 dBA are considered moderately loud; 66 to 75 dBA are considered loud; 76 to 110 dBA are considered very loud; and 111 dBA and above are considered uncomfortable. Sounds over 80 dB are considered dangerous.

Land uses that are considered to be sensitive to noise are known as sensitive receptors. Sensitive receptors can include residences, schools, libraries, hospitals, and other land uses where people generally expect and need a quiet environment.

Off-base residential housing is approximately 3,600 feet north of Site 1. The most prevalent source of noise at Laughlin AFB is created by aircraft flight operations.

The AICUZ is the DoD instruction on managing noise and flight safety for installations with airfields (DoD Instruction 4165.57 and AFI 32-7063). The most recent AICUZ study for Laughlin AFB was updated in 2008. The noise contours are shown in Figure 3-6.

The federal Noise Control Act of 1972 (42 U.S.C. § 4901 *et seq*. [1994]) requires that all federal agencies comply with applicable federal, state, interstate, and local noise control regulations. Local and state agencies have no applicable authority over military aircraft operations.



Source: Air Force 2008a

Figure 3-6 Noise Contours at Laughlin AFB

3.9 SOCIOECONOMICS

The area identified as the affected environment for socioeconomic analysis is both the City of Del Rio and Val Verde County because most of the effects on the population and economy would occur in this area. Data for Del Rio is included because it is the largest city in Val Verde County and the city nearest to Laughlin AFB. Other nearby cities includes Eagle Pass to the southeast and Brackettville to the east. Socioeconomic resources include data on population, employment, income, housing and schools.

Population includes the number of residents in the area and the recent change in population growth. Employment data includes labor sectors, labor force, and statistics on unemployment. Income information is provided as an annual total by county and as per capita income. Housing information is presented as total units, owner occupancy rate, and vacancy information. School enrollment and capacity are important considerations in assessing the effects of potential socioeconomic growth.

3.9.1 Population

The estimated population of Del Rio in 2008 was approximately 38,014, representing an increase of 12.2 percent over the 2000 household population of 33,867. By comparison, the population of Val Verde County was estimated at 47,280 in 2008 compared to 44,856 in 2000, a 5.4 percent increase (U.S. Census Bureau 2000a, b; 2008a, b).

3.9.2 Employment and Income

In 2008, the U.S. Census Bureau estimated that 20,340 residents of Val Verde County above the age of 16 were employed, 14,445 were reported as not being in the labor force, and 1,260 identified as unemployed. The median income was listed as $19,239 with 22 percent of all people in the county with an income below the poverty level. In 2008, the U.S. Census Bureau estimated that 15,578 residents of the City of Del Rio above the age of 16 were employed in 2008, 12,235 were reported as not being in the labor force, and 957 identified as unemployed. The median income was listed as $18,575 with 24.5 percent of all people in the city with an income below the poverty level.

Table 3-6 shows the breakdown of employment by industry sector in Del Rio and Val Verde County. The largest portion of the City, as well as the County, was employed in educational services, health care, and social assistance. An occupation in public administration was the second most common sources of employment and retail trade was the third. The percentage of the non-government work force in each sector for the City of Del Rio and Val Verde County are similar. Less than two percentage points separate each sector. Approximately 31 percentage of the population of Del Rio and Val Verde County are employed by the government. The economic effect of Laughlin AFB will be discussed in Section 3.9.5.

Table 3-6
Economic Characteristics for the Region of Interest in 2008

Economic Characteristics	Val Verde County (percent)	Del Rio (percent)
Agriculture, forestry, fishing, hunting, and mining	2.4	1.5
Construction	8.4	8.0
Manufacturing	7.1	6.1
Wholesale trade	1.4	1.7
Retail trade	13.0	14.5
Transportation, warehousing, and utilities	6.1	6.1
Information	2.0	1.9
Finance and insurance, and real estate and rental and leasing	3.7	4.2
Professional, scientific, management, administrative, and waste management services	4.6	4.0
Educational services, health care, and social assistance	23.0	24.3
Arts, entertainment, recreation, accommodation, and food services	8.5	8.4
Other services, except public administration	4.4	4.4
Public administration	15.4	14.9
Private wage and salary workers	62.9	62.3
Government workers	30.3	30.9

Source: U.S. Census Bureau 2008a, b

3.9.3 Housing Characteristics

Table 3-7 shows the total number of housing units in the City of Del Rio and Val Verde County for 2008. Del Rio had the lowest owner occupancy rate (85.6 percent) and the highest owner/renter vacancy rate (14.4 percent). The median home values for the City of Del Rio ($79,900) and Val Verde County ($78,800) are lower than the national average of $192,400.

Table 3-7
Housing Characteristics 2008

Housing	Val Verde County	Del Rio
Total Units	17,489	13,311
Owner Occupancy Rate	88.0	85.6
Vacancy: Owner/Renter	12.0	14.4
Number Vacant	3,214	1,914

Source: U.S. Census Bureau 2008a, b

3.9.4 Schools/Education

Del Rio has one school district, the San Felipe-Del Rio Consolidated School District which has 8 elementary schools, 4 middle schools, and 3 high schools with a total enrollment of 10,333 students in

Pre-Kindergarten through 12th grade. Additionally, there are 2 public charter schools with 284 students and 13 private schools with 1,358 students. Del Rio also has 5 colleges including Embry-Riddle University located on Laughlin AFB (Bing 2010). Table 3-8 shows the educational attainment for the City of Del Rio and Val Verde County for 2008.

Table 3-8
Educational Attainment within the Region of Interest for 2008

Del Rio (percent)	Val Verde County (percent)	Del Rio (percent)
Less than 9th grade	24.8	27.0
9th to 12th grade, no diploma	1.0	13.8
High School Graduate (include equivalency)	27.0	27.2
Some College, No Degree	14.8	14.0
Associate’s Degree	5.2	5.0
Bachelor’s Degree	9.5	8.2
Graduate or Professional Degree	4.8	4.8
Total Population Over 25 Years Old	28,778	23,331

Source: U.S. Census Bureau 2008a, b

3.9.5 Economic Impact of Laughlin AFB

3.9.5.1 Base Population

In 2008 Laughlin AFB had a total base population of 5,194 including 4,038 military and their families and 1,156 civilian employees. The total population has changed by 3.9 percent since 2007. Table 3-9 shows the population data for 2007 and 2008.

Table 3-9
Laughlin AFB Population Data

Fiscal Year	Total	Military	Families	Civilians
2007	5,407	1,574	2,536	1,297
2008	5,194	1,532	2,506	1,156

Source: Air Force 2008c, 2009c

3.9.5.2 Economic Impact on Community

The Economic Impact Region, the area encompassed by a 50-mile radius around Laughlin AFB which includes the City of Del Rio experiences a positive monetary impact from the activities at the base. Primary impacts results from direct expenditures by base personnel for payroll, construction and services, materials, and supplies and equipment. According to the 2007 and 2008 Economic Impact Reports the annual impact totaled more than $236 million dollars each year with payrolls for each year at $123.4 million and $136.7 million.

3.10 ENVIRONMENTAL JUSTICE AND THE PROTECTION OF CHILDREN

EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, directs federal agencies to, “make achieving environmental justice part of its mission by

identifying and addressing, as appropriate, disproportionately high and adverse high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories." Environmental justice means that, to the greatest extent practicable and permitted by law, all populations are provided the opportunity to comment before decisions are made; allowed to share in and not excluded from benefits of actions; and are not affected in a disproportionately high and adverse manner by government programs and activities affecting human health or the environment (EO 12898 and Department Regulation 5600-2). Tables 3-10 and 3-11 provide data on potential environmental justice populations in the area of Laughlin AFB. Table 3-10 shows the race and ethnicity characteristics of the population of Del Rio and Val Verde County. Hispanic or Latino formed the dominant racial minority in 2008. Low-income households can be subject to disproportionate environmental effects. Poverty statistics can provide a measure of the distribution and prevalence of low income levels.

Table 3-10
Total Population of Del Rio and Val Verde County by Race/Ethnicity 2008

Race/Ethnicity	Del Rio	Val Verde County	Percent Difference
White	5,988	9,172	34.7
Black or African American	481	781	38.4
Native American	70	70	0
Asian	173	277	37.5
Native Hawaiian and Other Pacific Islander	0	0	0
Hispanic or Latino*	31,153	37,147	16.1
Some Other Race	5,797	6,405	9.4
Two or More Races	116	187	37.9
Total	38,014	47,667	20.3

Source: U.S. Census Bureau 2008a, b
Note: *In combination with other races. The categorical figures/percentages may add up to more than 100 percent because individuals may report more than one race.

Table 3-11 provides poverty statistics for Del Rio and Val Verde County. The poverty rate for families, individual persons, and children under the age of 18 in Del Rio is slightly higher than Val Verde County.

Table 3-11
Poverty Statistics for Del Rio and Val Verde County 2008

	Del Rio	Val Verde County	Percent Difference
All Families living in poverty	19.9	18.1	5.5
Population living in poverty	24.5	22.2	9.3
Children under 18 living in poverty	29.8	28.0	6.0

Source: U.S. Census Bureau 2008a, b

EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks* (62 Federal Register, 19885, 23 April 1997), states that each federal agency shall make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children and ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks. Environmental health risks and safety risks mean

risks to health or to safety that are attributable to products or substances that the child is likely to come into contact with or to ingest. These risks are most likely to be encountered in areas where children are present, for example schools, playgrounds, day care facilities, and neighborhoods with high concentrations of children.

3.11 UTILITIES/INFRASTRUCTURE

Infrastructure typically refers to the systems and physical structures that enable a population in a specified area to function. Components of the infrastructure at Laughlin AFB include transportation and circulation (i.e., movement of vehicles), and utilities (communication lines, drinking water, electricity, natural gas, solid waste handling and wastewater). Transportation, circulation, communication lines, drinking water, natural gas, solid waste handling and wastewater would not be significantly affected by the Alternative A - Preferred Alternative or Alternative. Therefore, this EA focuses on electricity, electrical power, transportation, and communication. Outside sources of electric power used by Laughlin AFB are provided by Champion Energy. Average annual electricity used on the base and supporting facilities was approximately 42 million kWh per year. Peak monthly use is recorded in the summer months where the monthly use is over 3.9 million kWh with a peak of over 6.6 million kWh (Air Force 2007a, 2008b, 2009a, 2010). Table 3-12 shows the fiscal year and quantity of electricity used by Laughlin AFB from 2007 to 2010.

Table 3-12
Electrical Power Usage at Laughlin AFB

Fiscal Year	Electricity Used (KWH)
2007	41,840,207
2008	41,681,966
2009	41,804,567
2010	44,544,294
Average	**42,467,758**

Source: Air Force 2007a, 2008b, 2009a, 2010

3.11.1 Digital Airport Surveillance Radar

Due to the mission at Laughlin AFB, the base houses a ASR-11/AN/GPN-30 Digital Airport Surveillance Radar (DASR). The DASR provides primary surveillance radar (PSR) coverage to 60 nautical miles and monopulse secondary surveillance radar (MSSR) coverage to 120 nautical miles from Laughlin AFB. At a pilot training base, the DASR is a key tool used to support flight operations (Figure 3-7).

Figure 3-7 Digital Airport Surveillance Radar (DASR) at Laughlin AFB

Radars used for long range surveillance tend to operate at lower frequencies than the radiation needed to create the solar energy. The DASR operates at a frequency range of approximately 1,030 to 1,090 megahertz (MHz) for MSSR and 2,700 to 2,900 MHz for the PSR (Raytheon 2009). The frequency of visible light (sunshine) is above 110 gigahertz (GHz) with a wavelength of approximately 0.00005 centimeters compared to the DASR which operates at frequency range of 1-3 GHz and a wavelength of 15 centimeters.

3.12 WATER RESOURCES

Laughlin AFB is located within the Rio Grande Watershed which flows into the Rio Grande River and then discharges into the Gulf of Mexico. The total Rio Grande Watershed drainage area is 182,200 square miles and has the Pecos River, Devils River, Alamito Creek, and San Felipe Creek as its major tributaries within Texas (Air Force 2007c). Laughlin AFB is comprised of four drainage areas. Two of the four areas have a relatively high percentage of impervious cover accounting for the majority of the installation runoff (Air Force 2007c). Four drainage areas discharge to water bodies located within or adjacent to Laughlin AFB: Sacatosa Creek, Zorro Creek, two unnamed tributaries, and the golf course ponds. Sacatosa Creek originates approximately 7.5 miles north-northeast of Laughlin AFB, and flows along the eastern portion of Laughlin AFB. Sacatosa Creek receives discharge from the unnamed tributary that flows through the base, eastern base overland flow, and from the treatment lagoons. Zorro Creek originates approximately 200 yards north-northwest of Laughlin AFB, and flows along the western

portion of the base, receiving discharges from the northwest area of the base. Both Sacatosa and Zorro Creeks discharge into the Rio Grande River (Air Force 2007c). The second unnamed tributary receives overland flow from the golf course, family housing, and discharge from the golf course ponds prior to flowing into the Rio Grande River (Air Force 2007c).

Permitting for point and storm water discharges has been delegated to the State of Texas by the EPA under the National Pollutant Discharge Elimination System (NPDES). Individual and general storm water permits require the permittee to develop and implement a pollution prevention plan to monitor discharges for specific pollutants. Laughlin AFB is an industrial facility and, as such, has obtained a TXR050000 Multi-Sector General Permit from the Texas Commission on Environmental Quality (TCEQ) (TCEQ 2006). This permit (Number TXR05M844) allows Laughlin AFB to discharge storm water associated with industrial activities into receiving waters as designated in the Texas Surface Water Quality Standards. The permit requires monitoring of specific pollutants at outfalls, utilization of best management practices (BMPs), and implementation of engineering controls to control runoff (Air Force 2003).

3.12.1 Groundwater

Laughlin AFB is located above the Edwards-Trinity Aquifer System. The Edwards-Trinity Aquifer System, shown in Figure 3-8, occupies an area of approximately 35,500 square miles in west-central Texas. The groundwater of the Edwards-Trinity Aquifer flows from the north to the south and southeast and typically includes a recharge and artesian zone. The aquifer is generally recharged by direct precipitation. Groundwater is located in both shallow unconfined and deeper confined units (United States Geological Survey [USGS] 1995).

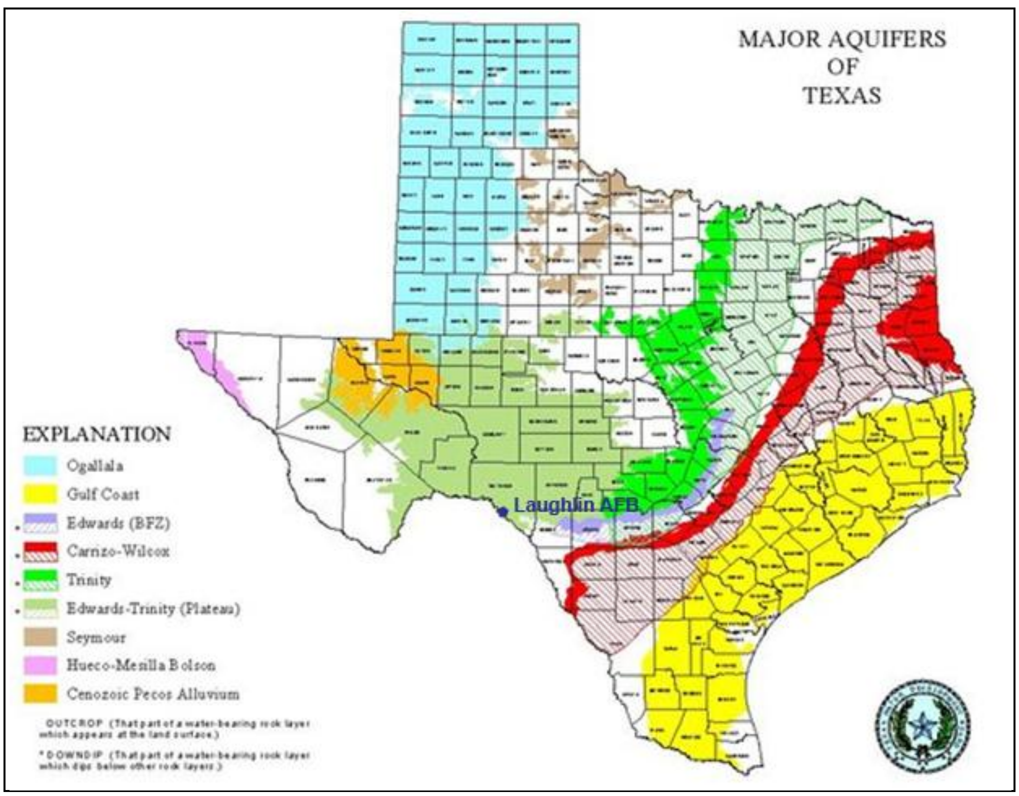


Figure 3-8 Major Aquifers of Texas

Groundwater is withdrawn from the Edwards-Trinity Aquifer from wells reaching depths of 150 to 300 feet below surface and the wells generally produce 50 to 200 gallons of water per minute. The groundwater withdrawn from this aquifer is primarily used for agricultural irrigation. The water obtained from the Edwards-Trinity Aquifer contains calcium bicarbonate and high concentration of dissolved solids, making the water a poor source for drinking water. The source of drinking water for the City of Del Rio and Laughlin AFB are the San Felipe Springs. San Felipe Springs are where the Edwards-Trinity Aquifer naturally reaches the surface under artesian pressure through a fault in the rock. The San Felipe Springs are the fourth largest springs in Texas and consist of ten or more springs that extend over a mile along San Felipe Creek (USGS 1995). The San Felipe Springs produce an average of 135 to 150 cubic feet per second (cfs) (USFWS 1999). These springs are located approximately five miles west northwest of Laughlin AFB.

3.12.2 Wetlands

EO 11990, *Protection of Wetlands*, 24 May 1977, directs federal agencies to consider alternatives to avoid adverse effects and incompatible development in wetlands. Federal agencies are directed to avoid new construction in wetlands, unless the agency finds there is no practicable alternative to construction in the wetland, and the proposed construction incorporates all possible measures to limit harm to the wetland. The CWA sets the basic regulatory framework for regulating discharges of pollutants to US waters. Section 404 of the CWA establishes the federal program to regulate the discharge of dredged and fill material into waters of the U.S., including wetlands. Four federal agencies are responsible for identifying and regulating wetlands: the United States Army Corps of Engineers (USACE), USEPA, USFWS, and Natural Resources Conservation Service (NRCS). The USACE and USEPA are primarily responsible for making jurisdictional determinations and regulating wetlands under Section 404 of the CWA. The USACE also makes jurisdictional determinations under Section 10 of the *Rivers and Harbors Act of* 1899. The NRCS has developed procedures for identifying wetlands for compliance with the *Flood Security Act of* 1985 and the USFWS has developed a classification system for identifying wetlands.

No formal wetland delineation project has been conducted at Laughlin AFB. However, previous studies have identified areas with potential wetlands. These areas are generally located in undeveloped areas outside the eastern perimeter of Laughlin AFB and far northwest corner, north of the Alternative A - Preferred Alternative site (Air Force 2006).

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4.0 ENVIRONMENTAL CONSEQUENCES

Chapter 4.0 presents the environmental consequences of the Preferred Alternative and Alternatives for each resource area discussed in Chapter 3.0. To define the consequences, this chapter evaluated the project elements described in Chapter 2.0 against the affected environment identified in Chapter 3.0. Cumulative effects of the Preferred Alternative with other past, current, and foreseeable future actions are presented at the end of Chapter 4.0. The following assumptions we made to determine the environmental consequences:

- The construction of the PV solar array would take up to six months to complete;
- Up to 15 workers would be required for grading, digging, leveling, construction of concrete pads, fencing, battery storage building, and solar array panels; and
- Once completed the PV solar array would be operated by a private entity.

4.1 AIR QUALITY

The ROI for air quality was defined as Val Verde County where a PV solar array with the capacity of at least 10-MW AC would be constructed and operated. To evaluate air emissions and their impact on the ROI, the emissions associated with the project activities were compared to total emissions on a pollutant-by-pollutant basis. Potential impacts to air quality would be identified as any pollutants that exceeds the *de minimus* threshold or permit threshold.

This project does not require a Conformity Review because the project is not within any non-attainment or maintenance areas. Estimated CO emissions from the Preferred Alternative would be well below the conformity *de minimus* threshold of 100 tons per year.

4.1.1 Alternative A – Preferred Alternative

The air quality analysis focused on construction emissions, including transportation-related emissions. Under the Preferred Alternative (85 acres) would be used for construction of the solar power system. Site 1 has rolling terrain with a shrub vegetation cover.

Emissions from construction and demolition activities have been estimated using a detailed spreadsheet model. The spreadsheet model calculates criteria pollutant emissions, diesel particulate emissions, and GHG emissions from construction or demolition activities and equipment. Criteria pollutant emission estimates are provided for reactive organic compounds, nitrogen oxides, carbon monoxide, sulfur oxides, PM_{10}, and $PM_{2.5}$. Exhaust emissions of PM_{10} from construction and demolition equipment provide the estimate of diesel particulate matter emissions. Greenhouse gas emission estimates are provided for carbon dioxide, methane, and nitrous oxide. The overall global warming potential of GHG also is calculated in terms of carbon dioxide equivalents.

The spreadsheet model uses a conventional approach to estimating emissions from construction equipment and activity that entails the following steps:

- Dividing the construction or demolition project into activity phases that have similar equipment requirements;
- Identifying equipment types needed for each construction or demolition phase;

- Identifying how many items of each type will be needed, the typical horsepower rating for the item (model provides defaults), and the typical engine load factor (model provides defaults);
- Identifying the hours per day with active use for each equipment item;
- Identifying the fraction of each use hour when the equipment will actually be operating (model provides defaults);
- Identifying the overall disturbed area size for each phase of construction or demolition activity;
- Identifying the duration of each construction or demolition phase;
- Identifying the typical area size that will be disturbed on a given day during each phase of construction or demolition activity;
- Identifying typical fugitive dust emission rates for each phase of construction or demolition activity (model provides defaults); and
- Identifying which construction or demolition phases overlap with each other.

The spreadsheet model summarizes criteria pollutant and GHG emissions by activity phase in terms of daily, quarterly, and annual emissions. The spreadsheet model also provides estimates of off-site truck trips and construction worker commute trips.

The spreadsheet includes a user-modifiable emission rate database of 519 entries covering 115 basic equipment types. Entries for each equipment type are subdivided into engine size and fuel type categories that correlate with emission standards that have been adopted in recent years by the USEPA. In addition to equipment powered by conventional diesel, gasoline, and compressed gas (propane/CNG/LNG/LPG) engines, the database includes information for electric arc welders, oxy-fuel welders, oxy-fuel cutting torches, plasma cutting torches, stationary diesel engines, large equipment powered by diesel-electric or turbine engines, and stationary gas turbine generators. Database entries also address multi-engine equipment designs for scrapers, concrete pavers, concrete finisher-vibrators, and off-road haul trucks. Metal fume emissions have been incorporated into the PM_{10} emission rates for welders and cutting torches. Fugitive PM_{10} emissions have been incorporated into the emission rates for rock drills, jackhammers, pavement breakers, pavement scarifiers, concrete/industrial saws, and abrasive blasting equipment. Default database entries are provided for the appropriate range of small, medium, and large engine sizes for each equipment type. Default engine sizes are representative of current equipment models from several major manufacturers as well as older equipment models that are still in use.

Greenhouse gas emission rates used in the spreadsheet model are based on the Climate Action Registry (CAR) 2007 general GHG emissions reporting protocol. Most of the GHG emission rates in the CAR protocol document are based on equipment or vehicle fuel consumption rates. Equipment fuel consumption estimates used in the spreadsheet model are derived from horsepower-hour based fuel use data presented in documentation reports for the 2005 version of the USEPA NONROAD model (USEPA 2004). The spreadsheet model computes the overall global warming potential (GWP) of carbon dioxide, methane, and nitrous oxide emissions using carbon dioxide equivalence factors identified by the Intergovernmental Panel on Climate Change (IPCC). Users can select from the 1995, 2001, or 2007 IPCC equivalence factor data sets. The 2007 data set is the default selection.

In addition to equipment engine emissions, CNSTEMIS calculates emissions from several other construction-related sources including:

- Fugitive dust emissions from general construction and demolition site disturbance;
- Fugitive dust from mechanical or explosive building demolition;
- Fugitive dust from construction blasting;
- Volatile organic compound (VOC) emissions from the curing of asphalt pavement;
- VOC emissions from paints and surface coatings; and
- PM_{10} aerosol emissions from spray painting activities.

In addition to accounting for active dust control program effects, the spreadsheet model allows emission calculations for fugitive dust from site disturbance to account for the seasonal frequency of precipitation events, frozen ground conditions, and snow cover. Fugitive dust emission estimates also can be adjusted to reflect the seasonal effects of persistently high soil moisture conditions from shallow perched water tables, seeps, or other natural factors. Natural dust control factors are applied to the residual fugitive dust generated after accounting for active dust control program effects. Historical precipitation data from the Del Rio Airport (Western Regional Climate Center 2008) was used to estimate natural dust control.

Emissions from construction-related traffic were estimated using the USEPA MOBILE 6.2 vehicle emission rate model (USEPA 2003). The construction emissions spreadsheet model summaries of off-site truck trips and construction worker commute trips were used for the analysis. Construction worker commute trip estimates included adjustments for assumed ridesharing rates. Two-person carpools were assumed for 25 percent of construction workers in each construction phase. Average one-way commute distances were assumed to be 10 miles. Average one-way truck trip distances were varied by construction phase to reflect differences in probable truck traffic origin-destination patterns. One-way construction truck trip distances of 15 miles were assumed for local area truck traffic (gravel, cement, other local building materials, and landfill-related truck traffic), with a trip distance of 150 miles assumed for solar array system and storage battery components.

The emissions analysis divided overall construction activity into four activity phases: (1) site preparation (vegetation clearing, site grading, access roads, and staging areas); (2) installation of underground cables; (3) PV solar array installation; and (4) construction of the electrical equipment building that would house inverters, transformers, other electrical equipment, and storage batteries. Construction activity was assumed to occur over a six-month period (April through September) in 2011.

Table 4-1 summarizes annual criteria pollutant emissions from on-site construction activity and off-site construction-related traffic for the Preferred Alternative.

Table 4-1
Estimated Criteria Pollutant Emissions from Construction of the PV Solar Array at Preferred Alternative Site

Emissions Component	Estimated 2011 Pollutant Emissions, Tons per Year					
	ROG	NO_x	CO	SO_x	PM_{10}	$PM_{2.5}$
Site Preparation	0.26	2.00	1.31	0.12	1.23	0.54
Underground Cables	0.01	0.11	0.08	0.00	0.01	0.01
Solar Array Installation	0.03	0.23	0.19	0.01	0.08	0.03
Electrical Building	0.00	0.03	0.02	0.00	0.02	0.01
Construction Worker Traffic	0.04	0.03	0.40	0.00	0.00	0.00
Construction Truck Traffic	0.03	0.42	0.11	0.00	0.01	0.01
Total	0.37	2.82	2.10	0.14	1.35	0.60

Notes: ROG – reactive organic gases (ozone precursors)
NO – nitrogen oxides (ozone precursors)
CO – carbon monoxide
SO_x – sulfur oxides
PM_{10} – inhalable particulate matter
$PM_{2.5}$ – fine particulate matter
Source: Tetra Tech Analyses (Appendix D)

In addition to the construction emissions summarized in Table 4-1, there would be small quantities of annual emissions from the operation of the PV solar array. Operational emissions would be associated with vehicle use for periodic cleaning of the array panels and normal facility maintenance activities. Emissions from these activities clearly would be less than construction emissions.

Annual criteria pollutant emissions from construction and operation of the Preferred Alternative would be less than three tons for any individual pollutant. Because there are no federal nonattainment or maintenance area designations for Val Verde County, Texas, the Preferred Alternative would not be subject to CAA conformity analysis requirements. Nevertheless, the CAA conformity thresholds for maintenance areas (100 tons per year of each pollutant) provide an indication of emission levels that could be considered significant. Because emissions from construction of the Preferred Alternative would be well below the thresholds used for CAA conformity evaluations in maintenance areas, criteria pollutant emissions from the Preferred Alternative would be a less than significant air quality impact; no mitigation would be required.

Table 4-2 summarizes annual GHG emissions from on-site construction activity and off-site construction-related traffic for the Preferred Alternative.

In addition to the construction emissions summarized in Table 4-2, there would be small quantities of annual GHG emissions from solar array operation. Operational GHG emissions would include sulfur hexafluoride leaks from transformers and inverters, and emissions from vehicles used for periodic cleaning of the array panels and normal facility maintenance activities. Sulfur hexafluoride (a very strong GHG) is used as an insulator in transformers, inverters, and related electrical system equipment. Emissions from these activities clearly would be less than construction emissions. Given the low voltages

of the transmission lines from the solar array system, only very small quantities of sulfur hexafluoride would be expected to be produced.

Table 4-2
Estimated Greenhouse Gas Emissions from Construction of the PV Solar Array at the Preferred Alternative Site

Emissions Component	Estimated 2011 Greenhouse Gas Emissions (tons per year[tpy])			
	CO_2	CH_4	N_2O	GWP, CO_2e
Site Preparation	186.73	0.006	0.004	188.05
Underground Cables	11.32	0.000	0.000	11.41
Solar Array Installation	26.58	0.001	0.001	26.84
Electrical Building	3.47	0.000	0.000	3.51
Construction Worker Traffic	19.68	0.000	0.000	19.68
Construction Truck Traffic	100.79	0.000	0.000	100.79
Total	348.57	0.007	0.005	350.28

Notes: CO_2 – carbon dioxide; GWP multiplier =1
CH_4 – methane; GWP multiplier = 25
N_2O – nitrous oxide; GWP multiplier = 298
CO_2e – carbon dioxide equivalents
GWP – global warming potential in CO_2e based on IPCC 2007 data
Tpy – tons per year
Source: Tetra Tech analyses (Appendix D)

While there is no State of Texas or federal impact significance thresholds for GHG emissions, the USEPA requires air permits for stationary sources that emit more than 75,000 tons of CO_2e per year. Compared to the USEPA permit threshold, creating less than 351 tons of CO_2e per year provides a clear indication that GHG emission from construction of the PV solar array at Site 1 would not have a significant impact.

The emissions are extremely small, 0.00000123 percent of the estimated 257.5 million metric tons per year carbon dioxide equivalents (CO_2e) produced in the U.S. Although the impact of GHG resulting from the Preferred Alternative would be less than significant when compared to the mega-million tons of emissions created by other sources, it is still an issue of global concern. To help minimize these potential impacts on GHG, truck drivers and equipment operators would be instructed to limit truck idle times and the Contracting Officer would require the construction contractors have their engines optimized for fuel efficiency.

The proposed solar power system is expected to meet all of the electrical power needs of Laughlin AFB. As noted in Chapter 1, electrical power for Laughlin AFB is currently provided by Champion Energy. The mix of power generation sources used by Champion Energy has not been identified, but overall power generation in Texas comes primarily from combustion of natural gas, coal, and petroleum (Energy Information Administration 2010). About 9.5 percent of power generation in Texas is created from sources with no GHG emissions (hydroelectric, nuclear, wind, and solar power). Based on Energy Information Administration data, the overall Texas power generation mix has a GHG emission factor of 456 pounds (CO_2e) per megawatt-hour. Facility operations would displace GHG emissions that would otherwise result from alternative power generation sources; approximately 19 million pounds of CO_2e would not be produced.

There would be a short-term negative impact in air quality due to the increase emissions from heavy equipment used during the construction of the PV solar array; however there would a positive long-term impact from the use of the PV solar array. Once the PV solar array is operational, electricity generated for Laughlin AFB using non-renewable sources would no longer need to be generated, thus lowering emissions.

4.1.2 Alternative B – Alternate Site Alternative

The Alternate Site Alternative was evaluated in the same manner as discussed for the Preferred Alternative. The Alternate Site Alternative would use the Alternate Site, which is 75 acres. Site 2 has a grass vegetation cover and would require less site preparation activity than Site 1. Construction worker commute distances for the Alternate Site Alternative were assumed to be slightly longer than for the Preferred Alternative.

Table 4-3 summarizes annual criteria pollutant emissions from on-site construction activity and off-site construction-related traffic for the Alternate Site Alternative.

Table 4-3
Estimated Criteria Pollutant Emissions from Construction of the PV Solar Array at Alternate Site Alternative

Emissions Component	Estimated 2011 Pollutant Emissions (tons per year[tpy])					
	ROG	NO_x	CO	SO_x	PM_{10}	$PM_{2.5}$
Site Preparation	0.16	1.30	0.83	0.09	1.04	0.44
Underground Cables	0.01	0.11	0.08	0.00	0.01	0.01
Solar Array Installation	0.03	0.23	0.19	0.01	0.07	0.03
Electrical Building	0.00	0.03	0.02	0.00	0.02	0.01
Construction Worker Traffic	0.04	0.03	0.41	0.00	0.00	0.00
Construction Truck Traffic	0.03	0.41	0.11	0.00	0.01	0.01
Total	0.27	2.10	1.63	0.10	1.15	0.50

Notes: ROG – reactive organic gases (ozone precursors)
NO_x – nitrogen oxides (ozone precursors)
CO – carbon monoxide
SO_x – sulfur oxides
PM_{10} – inhalable particulate matter
$PM_{2.5}$ – fine particulate matter
tpy – tons per year
Source: Tetra Tech Analyses (Appendix D)

The Alternate Site Alternative would have slightly lower construction emissions than the Preferred Alternative due to a smaller site size and a lower intensity of site preparation activities. Operational emissions for the Alternate Site Alternative would be similar to those for the Preferred Alternative.

Because there is no federal nonattainment or maintenance area designations for Val Verde County, Texas, the Alternate Site Alternative would not be subject to CAA conformity analysis requirements. Nevertheless, the CAA conformity thresholds for maintenance areas (100 tons per year of each pollutant) provide an indication of emission levels that could be considered significant. Because emissions from

construction of Alternate Site Alternative would be well below the thresholds used for CAA conformity evaluations in maintenance areas, criteria pollutant emissions from this alternative would be a less than significant air quality impact.

Table 4-4 summarizes annual GHG emissions from on-site construction activity and off-site construction-related traffic for the Alternate Site Alternative.

Table 4-4
Estimated Greenhouse Gas Emissions from Construction of Alternate Site Alternative

Emissions Component	Estimated 2011 Greenhouse Gas Emissions (tons per year[tpy])			
	CO_2	CH_4	N_2O	GWP, CO_2e
Site Preparation	116.10	0.003	0.002	116.94
Underground Cables	11.10	0.000	0.000	11.19
Solar Array Installation	26.58	0.001	0.001	26.84
Electrical Building	3.47	0.000	0.000	3.51
Construction Worker Traffic	20.19	0.000	0.000	20.19
Construction Truck Traffic	98.58	0.000	0.000	98.59
TOTAL	276.02	0.005	0.004	277.24

Notes: CO_2 – carbon dioxide; GWP multiplier =1
CH_4 – methane; GWP multiplier = 25
N_2O – nitrous oxide; GWP multiplier = 298
CO_2e – carbon dioxide equivalents
GWP – global warming potential in CO_2e based on IPCC 2007 data
Source: Tetra Tech analyses (Appendix D).

The Alternate Site Alternative would have slightly lower GHG emissions from construction than the Preferred Alternative due to a smaller site size and lower site preparation activities. Operational GHG emissions for Alternate Site Alternative would be similar to those for the Preferred Alternative.

While there is no State of Texas or federal impact significance thresholds for GHG emissions, USEPA requires air permits for stationary sources that emit more than 75,000 tons of CO_2e per year. Compared to the USEPA permit threshold, creating less than 278 tons of CO_2e per year provides a clear indication that GHG emission from construction of the PV solar array at Site 2 would not have a significant impact.

The emissions are extremely small, 0.00000097 percent of the estimated 257.5 million metric tons per year CO_2e produced in the U.S. Although the impact of GHG resulting from the Preferred Alternative would be less than significant when compared to the mega-million tons of emissions created by other sources, it is still an issue of global concern.

The proposed solar power system is expected to meet all of the electrical power needs of Laughlin AFB. Power generation in Texas comes primarily from combustion of natural gas, coal, and petroleum (Energy Information Administration, 2010). About 9.5 percent of power generation in Texas is from sources with no GHG emissions (hydroelectric, nuclear, wind, and solar power). Based on Energy Information Administration data, the overall Texas power generation mix has a GHG emission factor of 456 pounds (CO_2e) per megawatt-hour. Facility operations would displace GHG emissions that would otherwise result from alternative power generation sources; approximately 19 million pounds of CO_2e would not be produced.

The impacts would be similar from those of the Preferred Alternative. There would be a short-term negative impact in air quality due to the increase emissions from heavy equipment used during the construction of the PV solar array; however there would a positive long-term impact from the use of the PV solar array. Once the PV solar array is operational, electricity generated for Laughlin AFB using non-renewable sources would no longer need to be generated, thus lowering emissions.

4.1.3 Alternative C – No-Action Alternative

Under the No Action Alternative, no solar power system would be constructed at Laughlin AFB. There would consequently be no direct air quality or climate change impacts from facility construction or operations. The No-Action Alternative; however, would not enhance Air Force compliance with the EPACT 2005 and EOs 13514 and 13423 and would continue reliance on commercial electrical power providers that derive the bulk of their power from fossil fuel sources that generate GHG emissions.

4.1.4 Measures to Reduce Impacts

Although no significant impacts are anticipated by the Preferred Alternative or the Alternate Site Alternative, there are potential impacts. To minimize these potential impacts on GHG, truck drivers and equipment operators would be instructed to limit truck idle times and the Contracting Officer would require the construction contractors have their engines optimized for fuel efficiency.

4.2 CLIMATE

Implementing the Preferred Alternative or any of the alternatives would not impact climate in the region. Climate could impact clearing, grading, construction, and operation of the solar array. These impacts would be seasonal. Rain could delay activities; however, the delays would be expected to be temporary. Minimization measures to reduce any impact resulting from the runoff of rain are addressed in Section 4.5.

4.3 BIOLOGICAL RESOURCES

Federal agencies are required by Section 7 of the Endangered Species Act (ESA) to assess the effect of any project on federally-listed threatened and endangered species. Under Section 7, consultation with the USFWS is required for federal projects if such actions could directly or indirectly affect listed species or destroy or adversely modify critical habitat. A conference is required if such action could directly or indirectly affect a proposed listed species or proposed critical habitat. It is Air Force policy to follow management goals and objectives specified in Integrated Natural Resources Management Plans (INRMP), and to consider special-status species, sensitive communities, and habitats recognized by state and local agencies when evaluating impacts of a project.

Impacts on biological resources would be considered significant if special-status species or their habitats; as designated by federal, state, or local agencies; were harmed, harassed, or destroyed by project-related activities. In addition, impacts to biological resources would be considered significant if substantial loss, reduction, degradation, disturbance, or fragmentation occurred in native species habitats or in their populations. These could be short- or long-term impacts; for example, short-term or temporary impacts may occur during project implementation, and long-term impacts may result from loss of vegetation and thereby loss of the capacity of habitats to support wildlife populations.

4.3.1 Alternative A – Preferred Alternative

If the Preferred Alternative is implemented, biological resources would be expected to experience less than significant short-term impacts during the grading and construction of the PV solar array and minor long-term adverse impacts resulting from loss of suitable habitat for foraging. Mitigation measures would be implemented as described in Section 4.3.4.

4.3.1.1 Vegetation

Implementing the Preferred Alternative would result in the removal of up to 85 acres of sparsely vegetated land as shown in Figure 4-1. Several individuals of a plant species could be lost during the clearing and grading of the site; however, it is unlikely that an entire plant species would be lost because of the distribution of the species in other locations in Val Verde County. Removing vegetation would result in loss of habitat, a long-term adverse impact. However, because this site is segmented by security fencing and on-base housing, and no threatened, endangered, or species of special concern are known to be located within the 85 acres, removal of the vegetation would be unlikely to result in a significant adverse impact on biological resources.

Figure 4-1 Vegetation at the Preferred Alternative Site

During new construction there is always a concern that invasive plant species will be spread over newly graded areas. To prevent the spreading of invasive plant species mitigation measures would be implemented. Specific control measures include requiring contractors to clean equipment and vehicles with high pressure air or water prior to use in the project area and before leaving unavoidable infestation zones in the construction areas. Cleaning should concentrate on the undercarriage, axles, frames, cross members, on and under steps, running boards, and front bumper/brush guard assemblies. Vehicle cabs

should be swept and refuse disposed of in waste receptacles. Care should be taken that wash water be retained on-site to prevent invasive plant material transport.

Additionally, the contractor would be required to use certified invasive weed-free imported materials (e.g., straw bales, fill material, and erosion control seed) when and where needed during construction, reclamation, maintenance, and operations.

4.3.1.2 Wildlife

Implementation of the Preferred Alternative would likely result in short-term, temporary impacts on common wildlife species expected to be in the local area as identified in Section 3.3.2. Several individuals of a wildlife species could be lost during the clearing and grading of the site due to crushing, digging, or burial; however, it is unlikely that an entire wildlife species would be lost because of the limited activities and distribution of the species in other locations. Increased soil erosion in adjacent habitats may also result in a loss of individuals. Construction noise and disturbance may also result in the abandonment of any breeding and/or roosting sites that could potentially occur in the trees or rock outcroppings and the disruption of foraging or roosting activities. These impacts may occur within the site as well as within adjacent habitats. These impacts would be localized, and due to the abundance of surrounding habitat, most wildlife species would likely move to suitable habitats that are out of the area of disturbance. Additional fencing at the site might create a barrier to wildlife movement, causing a short-term population displacement or alteration of population distribution. Consequently, while the potential exists, the impacts on wildlife are not expected to be significant.

4.3.1.3 Special Status Species

Impact to any special status species that might occur at Laughlin AFB by the implementation of the Preferred Alternative is expected to be less than significant.

Federal and State-Listed Threatened and Endangered Species

During a threatened and endangered species and habitat survey conducted in April 2011 a Black-capped Vireo, a migratory song bird on the Endangered Species List, was observed north of the wastewater treatment ponds, one mile to the east of the Preferred Alternative site, see Figure 3-2. Based on a subsequent survey conducted two weeks after the initial survey was complete, the bird was not observed. It is believed that since the bird was no longer observed, it is assumed to be a late migrant and not a resident of the area. The Texas horned lizard was documented as being present on base during surveys conducted in 1993 but not during the April 2011 survey. Unconfirmed reports of the presence of the Indigo snake at Laughlin AFB have also been documented. Although suitable habitat for the federally and state-listed species, excluding the Black-capped Vireo, may occur within the Preferred Alternative site, the available habitat is not critical habitat and the presence of this species has not been documented in this area. Due to the distance from where the Black-capped Vireo was observed, the habitat is not suitable for Black-capped Vireos, and the conclusion that the bird was a late migrant, significant impacts to threatened and endangered species are not anticipated.

State-Listed Species of Concern and Rare and Sensitive Species

There are several state-listed species of concern with suitable habitat on or in the vicinity of Laughlin AFB. The Golden-cheeked Warbler may migrate through the area, but has not been confirmed as a nesting resident of Val Verde County. Four rare species listed for Val Verde County are known to exist at Laughlin AFB; these include the Loggerhead shrike, Mexican hooded-oriole, Audubon’s oriole, and

Olive sparrow based on surveys in 1993. During the April 2011 survey, only the Olive sparrow was observed. Clearing and grading the Preferred Alternative site would remove habitat that could be used by these species; however, the habitat is not identified as critical habitat and the species are likely to move to other nearby habitat. Construction activities may also result in abandonment of any breeding and/or roosting sites that could potentially occur in the brush, small trees, or grasslands, or disrupt foraging activities.

Laughlin AFB would maintain awareness of the presence of state-listed species of concern and rare and sensitive species and determine whether the management of listed species would mutually benefit these species as required by the INRMP.

4.3.2 Alternative B – Alternate Site Alternative

Under the Alternate Site Alternative, impacts on biological resources would be similar to the impacts identified for the Preferred Alternative. No significant impacts would be expected. Mitigation and minimization measures would be implemented as described in Section 4.3.4.

4.3.2.1 Vegetation

Implementing the Alternate Site Alternative would result in the removal of up to 75 acres of grasslands as shown in Figure 4-2. The vegetation at this site is primarily grass and invasive weeds that is routinely cut with tractor mowers. Removing vegetation would result in loss of habitat, a long-term adverse impact; however, because of the routine maintenance of the area the impacts would be considered less than significant and would be unlikely to result in a significant adverse impact on biological resources.

Figure 4-2 Vegetation at the Alternate Site Alternative

Like the Preferred Alternative site, mitigation measures would be implemented to prevent the spreading of these invasive plant species.

4.3.2.2 Wildlife

Impacts on wildlife would be expected to be less than for the Preferred Alternative if Alternate Site Alternative were implemented. Because the site is highly disturbed, wildlife may migrate through the area; however, the site is not identified as critical habitat and the species are likely to move to other nearby habitat. Some construction activities may also result in abandonment of any breeding and/or roosting sites that could potentially occur in the brush, small trees, or grasslands, or disrupt foraging activities to the east of the site along Sacatosa Creek. Consequently, while the potential exists, the impacts on wildlife are not expected to be significant.

4.3.2.3 Special Status Species

The Black-capped Vireo was observed 1.3 miles to the south-southwest of the Alternate Site Alternative, see Figure 3-2. As mentioned in Section 4.3.1.3, the bird is considered to be a late migrant and not a resident. Since the bird is considered a migrant, is located over a mile from the Alternate Site Alternative, and the site location is not considered to be Black-capped Vireo habitat, no significant impacts are expected.

4.3.3 Alternative C – No-Action Alternative

If the No-Action Alternative is implemented, no new impacts on biological resources would occur. Impacts on biological resources would not be present and no additional mitigation or minimization measures would be required.

4.3.4 Measures to Reduce Impacts

Although no significant impacts are expected, Laughlin AFB will implement minimization measures to reduce the potential for any adverse impacts resulting from the Preferred Alternative or Alternatives. This will include use of control measures to prevent the spread of invasive plant species by requiring the contractor to use certified invasive weed-free imported materials (e.g., straw bales, fill material, and erosion control seed) when and where needed and monitoring the selected site during clearing and grading activities for threatened or endangered species that might migrate through the area. Prior to commencing construction, a survey will be conducted to determine if the Black-capped Vireo, Longstalk Heimia, and/or Texas Trumpet are present within the site boundary. If a Black-capped Vireo is observed, construction of the PV solar array would not occur until the species has migrated from the area. If Longstalk Heimia and/or Texas Trumpets are observed, the species will be left in place and the footprint of the PV solar array will be modified as such to avoid the species. If federally or state listed threatened or endangered species are encountered during construction of the PV solar array, work will be ceased and 47 CES/CEAN will be contacted and consultation with the USFWS should occur.

4.4 CULTURAL RESOURCES

Significant impacts to cultural resources could occur if the preferred or alternative actions would adversely affect prehistoric or historic sites, sacred sites, or traditional cultural properties. An adverse effect is an undertaking that diminishes the integrity of a property’s location, design, setting, materials, workmanship, feeling, or association. These effects have the potential to occur due to the destruction or alteration of the property, isolation from or alteration of the environment, introduction of intrusive elements (visual, audible, or atmospheric), and neglect (Advisory Council on Historic Preservation and GSA Interagency Training Center 1995).

4.4.1 Alternative A – Preferred Alternative

The Preferred Alternative would have no impact on cultural resources at Laughlin AFB. The Preferred Alternative is more than 3,000 feet from any prehistoric or historic sites, sacred sites, or traditional cultural properties identified at Laughlin AFB. Cultural resources are managed under the Integrated Cultural Resources Management Plan. Although there are no cultural sites, traditional cultural properties, or Native American landscapes that would potentially be affected, consultation with the State Historic Preservation Office under Section 106 will be required.

4.4.2 Alternative B – Alternate Site Alternative

Impacts on cultural resources would be the same for Alternate Site Alternative as identified for the Preferred Alternative since the site is more than 3,000 feet from any prehistoric, sacred sites, or traditional cultural properties identified at Laughlin AFB. Since there would be no impacts, no mitigation would be required. Archaeological site 41VV1682 is located within the Alternate Site Alternative site boundary. The site has not been thoroughly investigated and has the potential to be included as either a State Archaeological Landmark or placed on the National Register of Historic Places.

4.4.3 Alternative C – No-Action Alternative

If the No-Action Alternative is implemented no new impacts on cultural resources would occur and no mitigation would be required.

4.4.4 Measures to Reduce Impacts

If Alternative B – Alternate Site Alternative was designated as the preferable and most practical action, Archaeological site 41VV1682 should undergo further investigation and the footprint of the PV solar array would be modified as such to ensure that the site is not disturbed. No mitigation measures are required for Alternative A – Preferred Alternative and Alternative C – No-Action Alternative.

4.5 GEOLOGY AND SOILS

A project may result in significant geologic impact if it increases the likelihood of or results in exposure to earthquake damage, slope failure, foundation instability, land subsidence, or other severe geologic hazards. It also may be considered a significant geologic impact if it results in loss of aesthetic value from a unique landform, loss of mineral resources, substantially affects the contaminant distribution and fate and transport of soils, or results in severe erosion or sedimentation.

4.5.1 Alternative A – Preferred Alternative

The Preferred Alternative would have no long-term adverse effects on geology and soils at Laughlin AFB because the area cleared and graded would be stabilized, where necessary, with compacted fill to provide the base for construction of the PV solar array. Soils at the Preferred Alternative location are characterized by very shallow gently sloping soils on upland areas. These soils formed in old outwash sediment over thick beds of caliche. As much as 20 percent of the surface is covered by limestone and caliche fragments. These soils are well drained and surface runoff is medium. Permeability is moderate, and available water capacity is very low.

Removing trees, bushes, and grasses during construction could cause or accelerate surface erosion during rain events. Mitigation measures described in Section 4.5.4 would be implemented to limit these potential short-term adverse impacts.

4.5.1.1 Geological Hazards

The base lies near the edge of the Balcones Fault Zone. There has been no recent seismic activity in the area. The solar panels would be bolted to concrete pads that would minimize movement during any seismic event. Consequently, the potential impact from geological hazards would be considered less than significant.

4.5.2 Alternative B – Alternate Site Alternative

The potential impacts on geology and soils and geological hazards would be similar if the Alternate Site Alternative were implemented instead of the Preferred Alternative. Impacts on geology and soils would be less than significant; however, mitigation measures described in Section 4.5.4 would be implemented to limit these potential short-term adverse impacts.

4.5.3 Alternative C – No-Action Alternative

If the No-Action Alternative is implemented the sites would remain in their present state; therefore, no new impacts on geology and soils would be present.

4.5.4 Measures to Reduce Impacts

Provisions would be included in the construction and operations contract to plant and maintain grasses, wildflowers, and indigenous vegetation in applicable areas to minimize erosion and runoff at the PV solar array site. Crushed rock will be placed under the PV panels, decreasing the potential for soil erosion to occur under the panels.

4.6 HAZARDOUS MATERIALS/HAZARDOUS WASTE/SOLID WASTE

The degree to which proposed construction activities could affect the existing environmental management practices was considered in evaluating potential impacts to hazardous materials and wastes, soil waste and ERP sites. Impacts could result if nonhazardous/regulated and hazardous substances were collected, stored and/or disposed of improperly or if impacted soil was encountered and impacted the proposed site.

4.6.1 Alternative A – Preferred Alternative

4.6.1.1 Hazardous Materials and Hazardous Waste

Construction of the PV solar array may require the use of hazardous materials by contractor personnel. Project contractors would comply with federal, state, and local environmental laws and would employ affirmative procurement practices when economically and technically feasible. All hazardous materials and construction debris generated by the construction would be handled, stored, and disposed of in accordance with federal, state, and local regulations and laws. Permits for handling and disposal of hazardous materials would be the responsibility of the contractor conducting the work.

In the event of a fuel spill during construction, the contractor would be responsible for its containment, clean up, and related disposal costs. The contractor would have sufficient spill supplies readily available on the pumping vehicle and/or at the site to contain any spillage. In the event of a contractor related

release, the contractor would contact 47 CES/CEAN and take appropriate actions to correct its cause and prevent future occurrences.

Lead batteries would be stored and utilized as a component of the PV solar array; the batteries would store generated electricity, to be used at a later date. Prior to the batteries arriving on Laughlin AFB, Air Force Form 3952, Chemical/Hazardous Material Request Authorization would need to be completed since the batteries contain lead and are considered a hazardous material. Once the batteries are spent or show any evidence of leakage or damage, they would be considered Universal Waste and must be managed (including storing and disposal) as such. The waste batteries would be required to be stored in a closed, structurally sound, and compatible container preventing a release into the environment. The container must be labeled or marked "Universal Waste-Battery(ies) or "Waste Battery(ies)" or "Used Batteries" and the batteries can be stored on Laughlin AFB no longer than one year from the date of generation. The waste batteries would be required to be either recycled or disposed of off-site. The recycler or disposal facility must be properly permitted.

4.6.1.2 Solid Waste

Construction of the proposed solar array would generate minimal quantities of solid wastes. The construction comprises ground disturbance and digging for concrete footings, transmission lines, and fencing. Concrete footings would be installed and solar panels would be assembled. Solid wastes that would be generated may include concrete, scrap wire, and packing materials. Contractors would be directed to recycle materials to the maximum extent possible, thereby reducing the amount of debris disposed of in landfills. Materials not suitable for recycling would be taken to a landfill permitted to handle construction debris wastes. The proper management and recycling or disposal of construction debris would be the responsibility of construction contractors. The amount of waste generated by the Preferred Alternative would not have a significant impact to the operating life of the landfill. No environmental impacts to solid waste management would be expected from implementation of the Preferred Alternative.

4.6.1.3 Environmental Restoration Program

Two MMRP sites are located adjacent to the Preferred Alternative site. Placement of the PV solar array would be adjusted so that the footings are not located within the footprint of the MMRP sites. Since the site location is adjacent to the MMRP sites, the potential to encounter impacted soils during construction activities related to the Preferred Alternative is present, however unlikely. If these activities caused contact with contaminated soils to occur, care would be taken to ensure that human health is protected from potentially contaminated soil by stopping work, contacting 47 CES/CEAN, and 47 CES/CEAN delineating the extent of the contaminated soils. With the measures taken, the potential impact on the MMRP sites would be less than significant.

4.6.2 Alternative B – Alternate Site Alternative

Impacts on hazardous materials, hazardous waste, solid waste, and ERP would be similar if Alternate Site Alternative were implemented instead of the Preferred Alternative. There is only one MMRP site at the Alternate Site Alternative site which is west of Site 2. The same construction protocols as required for the Preferred Alternative would be implemented if the Alternate Site Alternative site were selected for the construction and operation of the PV solar array.

4.6.3 Alternative C – No-Action Alternative

If the No-Action Alternative is implemented no new impacts on hazardous materials, hazardous waste, solid waste, or ERP would occur. Impacts on hazardous materials, hazardous waste, solid waste or ERP would not be present. Therefore, no mitigation measures would be required.

4.6.4 Measures to Reduce Impacts

There are no impacts expected to solid waste by implementing the Preferred Alternative or the Alternate Site Alternative. Prior to the lead batteries arriving at Laughlin AFB, Air Force Form 3952 would be completed and submitted. Once the batteries are spent or show signs of leakage, they would be stored in a closed, structurally sound, and compatible container preventing a release into the environment; labeled or marked as "Universal Waste-Battery(ies) or "Waste Battery(ies)" or "Used Batteries." The waste batteries would be required to be either recycled or disposed of off-site. The recycler or disposal facility must be properly permitted. Due to the locations of the Preferred Alternative and Alternate Site Alternative sites being adjacent to MMRP sites, if MMRP impacted soil is encountered during construction activities, work activities would cease and 47 CES/CEAN would be contacted.

4.7 LAND USE

Construction or modification activities associated with each alternative were examined and compared to existing land use conditions and land use plans. Impacts to land use are identified as they relate to changes in use classifications, extent of changes, and potential conflicting uses on- and off-base.

4.7.1 Alternative A – Preferred Alternative

Implementing the Preferred Alternative would be compatible with both current and planned land use. Land use associated with the project location site would be converted from unimproved grounds (developable land) to light industrial use. Since there would be no permanent change in ownership and land use would be consistent with the Laughlin AFB General Plan, no significant impacts on land use would be expected to occur if the Preferred Alternative were implemented.

4.7.1.1 Visual Impacts

The runways at Laughlin AFB are approximately 1.1 nautical miles (NM) from the Preferred Alternative site.

A primary constraint for an airport would be the visual impact because of the glare which may affect the pilots. According to Jim Patterson, Air Technology and Research Branch of the Federal Aviation Administration (FAA), at all installations that we have thus far assessed, glare has not been a problem for the pilots or for the air traffic control facilities (Airport Business 2009). In a separate study to determine the technical feasibility for siting a solar energy system at the Amsterdam Airport, the radiation reflection according to the visibility of the solar panels, can be neglected and only depends on the distance, the intensity of the reflections, and the reflective coefficient of the solar glass. If the reflection coefficient of the solar panel is chosen to be less than or equal to 3 percent, the reflection would be minimized (Janssen 2010). A reflection coefficient describes the intensity of a reflected wave of energy and can be used to calculate the amount of light transmitted through a medium. The smaller the coefficient, the less reflection from the panels is present, and the more light is transmitted through the medium.

Nellis AFB recently constructed a PV solar array on 140 acres of land on the base at approximately 1.1 NM from the runways. The Nellis AFB Public Affairs office concluded that while most solar panels reflect light, the panels installed at Nellis AFB will use a special solar cell that has a black appearance,

specifically chosen to complement the missions at Nellis AFB; these solar panels will not reflect light into the pilots' eyes, and they will be less reflective than lakes or other bodies of water that pilots routinely see inflight (Air Force 2007a). Figure 4-3 shows some of the solar panels present at the Nellis AFB solar array.

Figure 4-3 PV Solar Array at Nellis AFB

Constructing the PV solar array at the Preferred Alternative site would not be expected to result in any significant impact on visual resources or flight safety as a result of the reflectivity caused by the solar panels because the site is located over one mile from the runways. To ensure the reflectivity is minimized, the use of solar cells with a reflectivity coefficient of 3 percent or less would be required.

4.7.2 Alternative B – Alternate Site Alternative

The runways at Laughlin AFB are approximately 2,000 feet from the Alternate Site Alternative site.

The effects of implementing the Alternate Site Alternative would be similar to the effects of implementing the Preferred Alternative except that the location of the PV solar array would be extremely close to the primary runways at Laughlin AFB. Locating the PV solar array such that sunlight would be reflected towards an aircraft engaged in an initial straight climb following takeoff or towards an aircraft engaged in a straight final approach towards a landing could cause a distraction at one of the most critical phases of a flight operation. Consequently, the visual affect, as well as the potential safety issue associated with the reflectivity would make the implementation of Alternative B an adverse and potentially significant impact on land use.

4.7.3 Alternative C – No-Action Alternative

If the No-Action Alternative is implemented no new impacts on land use would occur. Impacts on land use would be less than significant and no additional mitigation or minimization measures would be required.

4.7.4 Measures to Reduce Impacts

To mitigate the potential impact to the visual resource, Laughlin AFB will utilize solar panels and associated devices that ensure the reflection coefficient is less than 3 percent and that the panels are positioned at angles where the potential for reflection is reduced. Also, if the Preferred Alternative is selected for implementation Laughlin AFB will submit a request for a Notice of Proposed Construction or Alteration (Form 7460-1) to the FAA before any actions are initiated (Appendix E). There would be no change in the land use classification if the Preferred Alternative or any of the Alternatives are implemented; consequently, no additional mitigation would be needed.

4.8 NOISE

When evaluating noise effects, several attributes are reviewed:

- Degree to which noise levels generated by mission operations, as well as ongoing construction activities are higher than the ambient noise levels;
- Degree to which there is hearing loss and/or annoyance; and
- Proximity of noise-sensitive receptors (i.e., residences) to the noise source.

An environmental analysis of noise includes the potential effects on the local population. Such an analysis estimates the extent and magnitude of the noise generated by the proposed and alternative actions.

4.8.1 Alternative A – Preferred Alternative

Two types of noise would be expected to occur as a result of the construction and operation of a PV solar array at Laughlin AFB; construction noise and transformer noise. The closest residential home is approximately 450 feet from the Preferred Alternative site.

Construction work would cause a temporary increase in sound above normal ambient noise levels. Noise would emanate from trucks, excavators, bulldozers, chain saws, augers, brush chippers, welders, saws, trenchers, and other pieces of equipment that would be used to clear, grade, and prepare the ground surface and during installation of the solar panels. The site of the Preferred Alternative has a sparse covering of vegetation and is fairly flat; the use of heavy equipment would be estimated to last for approximately 6 months. Short-term increases in noise levels would occur during the clearing and construction phase of the project. During the construction phase of the Preferred Alternative, based upon Table 4-5, the average noise level would be estimated at 90 dBA, with a baseline level at less than 65 dBA. Based on the Inverse Square Law of Noise Propagation (Harris 1991) noise levels would be reduced by 6 dBA as the source distance is doubled (e.g., at 50 feet -6 dBA, 100 feet -12 dBA, at 200 feet -18 dBA, at 400 feet -24 dBA, and at 800 feet -30 dBA), see Table 4-5. At 800 feet from the construction site the average construction site noise level would return to a baseline level, and an impact would not be present. The closest noise receptors are individual on-base residences located approximately 450 feet to the northeast. Based upon Table 4-5, the noise level would decrease to an approximate average of 65 dBA at 450 feet from the construction site which is near baseline and within the acceptable range under the U.S Department of Housing and Urban Development (HUD 2011), resulting in no significant impact.

Noise impacts from vehicles transporting workers and equipment would not be expected to be significant. Access to Laughlin AFB via US Highway 90 is restricted to authorized traffic. It is estimated that six additional vehicles would transport work crews of up to 10 workers to the Site each morning. Heavy equipment required for the project would be mobilized on site and demobilized via the main gate at US Highway 90 or the West Gate once it is no longer needed on site. Noise impacts resulting from adding

less than a dozen vehicles per day would not be expected to create a significant impact on noise on the area.

Table 4-5
Noise Levels Associated with Typical Construction Equipment

	Noise Level (dBA)					
Equipment	***At Site***	***50 feet***	***100 feet***	***200 feet***	***400 feet***	***800 feet***
Average Construction Site	91	85	79	73	67	61
Auger Drill Rig	91	85	76	70	64	58
Backhoe	86	80	74	68	62	56
Chain Saw	91	85	79	73	67	61
Compressor (Air)	86	80	74	68	62	56
Crane	91	85	79	73	67	61
Dozer	91	85	79	73	67	61
Dump Truck	90	84	78	76	70	64
Grader	91	85	79	73	67	61
Rock Drill	91	85	79	73	67	61

Source: Department of Transportation, Federal Highway Administration 2009

The operation of the PV solar array has the potential to create additional noise with the area of the Preferred Alternative. Transformers are designed for the transmission and distribution of electrical power. Apart from satisfying this functional performance objective, the operation of a transformer may induce annoying acoustic radiation. Transformer acoustic noise is a hum characterized by spectral spikes at harmonics of the fundamental frequency (100 Hertz [Hz] /120 Hz) which is twice the line supply frequency. The transformer's low frequency tonal noise components would be the major source of annoyance and intrusion, potentially invoking noise complaints from nearby residents located off-base to the east.

Transformers typically generate a noise level ranging from 60 to 80 dBA. Transformer noise will "transmit" and attenuate at different rates depending on the transformer size, voltage rating, and design. Few complaints from nearby residents are typically received concerning substations with transformers of less than 10 megavolt amperes (MVA) capacity, except in urban areas with little or no buffers. Complaints are more common at substations with transformers sizes of 20 to 150 MVA, especially within the first 500 to 600 feet (McDonald 2003). At 80 dBA the noise would be attenuated to less than 55 dBA at the closest residence without any mitigation (i.e., equipment placement, barriers or walls). Since the transformer would be expected to be a 15 kilovolts amperes (kVA) input with a capacity of 34.5 kVA, but still a hundred times smaller than the 10 MVA transformer that does not typically impact residents, it is unlikely the transformer noise would be significant.

4.8.2 Alternative B – Alternate Site Alternative

Temporary and long-term impacts on noise/sensitive receptors would be similar if the Alternate Site Alternative were implemented instead of the Preferred Alternative. The closest residence to the Alternate Site Alternative site is over 2,000 feet east of the site. At 2,000 feet, temporary noise levels generated during construction activities during the construction phase of the PV solar array would be attenuated to less than 55 dBA which is considered acceptable noise level; therefore, there would not be a significant

impact to the residences (U.S. HUD 2011). The closest commercial industrial site is over 500 feet from the Alternate Site Alternative site. At 500 feet the dBA for an average construction site would be 65 dBA, which is compatible with industrial noise standards and is considered to be acceptable within urban areas (U.S. HUD 2011), and would not be considered a significant impact.

Traffic noise along US Highway 90 north of the Alternate Site Alternative site would be expected to range from 72 dBA to over 86 dBA at 55 miles per hour depending on the traffic and road conditions; consequently, noise at or below that level would be part of the normal background noise. The noise levels generated at the site during clearing and construction activities would be the same as for the Preferred Alternative site. Because the Alternate Site Alternative site would be located over 500 feet from the nearest industrial building (located across US Highway 90), the noise levels would be below the dBA noise level of the noise contours for the airfield. Road noise levels from worker commute and equipment mobilization and demobilization would be the same as identified for the Preferred Alternative and no additional mitigation measures would be required. Transformer noise would be the same as describe for the Preferred Alternative; however, because the closest industrial building is more than 1,000 feet from the Alternate Site Alternative Site transformer noise could be heard. Consequently, mitigation measures would be implemented to reduce the potential noise below 50 dBA, a less than significant noise level for residential areas at night.

4.8.3 Alternative C – No-Action Alternative

If the No-Action Alternative is implemented, no new impacts on noise would occur. Impacts on noise would be less than significant and no additional mitigation or minimization measures would be required.

4.8.4 Measures to Reduce Impacts

The following mitigation measures would be implemented to ensure noise resulting from the construction and operation of the PV solar array would not result in a significant impact on the human or natural environment. Site preparation and construction activities would be limited to normal working hours of 800 to 1900. The transformer and uninterrupted power supply (UPS) building will be located at least 500 feet from the closest residence and 1,000 feet from the Digital Airport Surveillance Radar (DASR). Properly constructed sound barriers can provide several decibels of reduction in the noise level. An effective barrier involves a proper application of basic physics of transmission loss through masses, sound diffraction around obstacles, standing waves behind reflectors, and adsorption at surfaces. A sound barrier made of vegetation or concrete block would be installed around the building, if necessary to attenuate the sound emanating from the building.

4.9 SOCIOECONOMICS

4.9.1 Alternative A – Preferred Alternative and Alternative B – Alternate Site Alternative

Under the Preferred Alternative or Alternate Site Alternative the potential impacts on socioeconomics would be the same. Potential socioeconomic effects were assessed in terms of direct effects that would be created during preparation and construction of the Site and indirect effects that would result from the operation of the Site.

The construction of the PV solar array would provide a short-term beneficial impact on socioeconomics. Construction activities would generate 15 jobs during the construction activities, 11 jobs in support of equipment and supply chain activities, and 12 jobs from induced impacts. Annual on-site labor impacts would result in 3 jobs for maintenance of the solar array and 2 to 3 jobs through local revenue and supply

chain impacts and induced impacts. Based on the employment in Del Rio and Val Verde County (U.S. Census Bureau 2008b) adding 15 jobs would be an increase of less than 0.1 percent, a less than significant number. Since the workforce would be expected to come from the local Del Rio area, impacts on housing, schools and the local population would not be expected to be significant. Additionally, it was estimated that the life-cycle savings of using the PV solar array would result in a savings of $5.5 million (Appendix F).

4.9.2 Alternative C – No-Action Alternative

If the No-Action Alternative is implemented, there would be no changes in the socioeconomics of the area; therefore, no new impacts on socioeconomics would occur.

4.9.3 Measures to Reduce Impacts

Implementation of the Preferred Alternative or Alternate Site Alternative would have a positive short-term impact, due to the construction of the PV solar array. This positive short-term impact is not considered to be significant and does not require mitigation measures.

4.10 ENVIRONMENTAL JUSTICE AND THE PROTECTION OF CHILDREN

Implementing the Preferred Alternative or Alternatives would result in adverse environmental effects if any of the following criteria was identified:

- Significant impacts on employment, income, and population; or
- Pose potentially substantial harm to the safety of children during construction activities.

4.10.1 Alternative A – Preferred Alternative and Alternative B – Alternate Site Alternative

Environmental Justice addresses the disproportionately high and adverse human health or environmental effects on minority and low-income populations. Determination of disproportionately high and adverse human health effects are established by identifying the impact on the natural or physical environment and influence on minority and low-income populations. The construction and subsequent operation of the solar array would not create any significant adverse impacts on human health because construction activities would be limited to sites located on the base where minority or low-income populations are not present, and therefore, would not be affected. Access to the base is restricted to authorized personnel. The construction areas would be restricted to effectively bar any person, including children, from unauthorized access. To minimize any potential for human health effect that might result from using any hazardous materials at the sites, hazardous materials would be managed per TCEQ and Air Force best management practices and Air Force pollution prevention guidelines. The completed PV solar array would have a fence surrounding the area as a safeguard to prevent unauthorized access. Implementing the Preferred Alterative or Alternate Site Alternative would not displace any low-income or minority populations; consequently, no significant impact on environmental justice would be expected and no mitigation would be required.

The Preferred Alternative or Alternate Site Alternative site is within the boundaries of a restricted access military installation which includes a family housing development where children are typically present. Because the Preferred Alternative site is approximately 300 feet from the nearest housing area it would be expected that children would observe the construction activities. Consequently, workers would be reminded that their children should not be brought to the site because of the inherent dangers associated with site grading, clearing, and construction. The Site Safety Plan would consider adequate measures to

protect children during the implementation of the Preferred Alternative or Alternate Site Alternative. Such measures may include barrier fencing and warning signs at the project site and implementation of dust control measures. Implementing a Site Safety Plan would mitigate any potential impacts on children to a less than significant level.

4.10.2 Alternative C – No-Action Alternative

If the No-Action Alternative is implemented no new impacts on environmental justice and the protection of children would occur. Impacts on environmental justice and the protection of children would not be present and no additional mitigation or minimization measures would be required.

4.10.3 Measures to Reduce Impacts

There is a less than significant impact expected on environmental justice and the protection of children if the Preferred Alternative or Alternate Site Alternative is implemented. To minimize any potential for human health effect that might result from using any hazardous materials at the sites, hazardous materials would be managed per TCEQ and Air Force best management practices and Air Force pollution prevention guidelines. Also implementation of a Site Safety Plan would be required to mitigate any potential impacts on children to a less than significant level.

4.11 UTILITIES/INFRASTRUCTURE

Issues and concerns regarding the impacts on infrastructure are typically related to the availability of necessary infrastructure to support the project and the creation of excess demand on those systems such that they must be changed or updated.

4.11.1 Alternative A – Preferred Alternative

4.11.1.1 Utilities

Based on annual energy demands as shown in Table 3-12, the operation of a 10-MW PV solar array would require an average annual production of 42,468 MW. Based on the available sunshine a 10 MW system located at Laughlin AFB could produce approximately 44,535 MW per year, (Appendix C, Table C-1), or 100 percent of the normal yearly demand for the main base electrical demands. Peak demand could exceed the amount of energy produced; consequently, a connection to the grid for backup would be recommended.

Power quality is a technical concern for utilities and PV solar array system owners. Power quality is analogous to water quality; just as municipal water suppliers and individual water wells must meet certain standards for bacteria and pollutant levels, utility power is consistently supplied at a certain voltage and frequency. In the United States, residences receive single-phase AC power at 120/240 volts (V) and 60 cycles per second (Hz). Commercial buildings typically receive either 120/240 V single-phase power or higher voltage (e.g., 120/208 or 277/480) three-phase power, depending on the size of the building and the types of loads in the building.

Each type of PV solar array system has its own output characteristics based on the technology employed. Even systems that use inverters vary depending on the inverter design, the control algorithms and the characteristics of the input power source. Device-specific power-quality issues therefore are not addressed here. Power quality is important because electronic devices and appliances are designed to receive power within a designated range of voltage and frequency parameters, and deviations outside those ranges can cause appliance malfunction or damage. Power quality problems can manifest

themselves as extraneous lines on a television screen or static noise on a radio, which is sometimes noticed when operating a microwave oven or hand mixer. Noise, in electrical terms, is any electrical energy that interferes with other electrical appliances. As with any electrical device, an inverter, which converts the DC power into usable AC power, can introduce noise that may cause interference. The PV solar array constructed and maintained would be compatible with the current electrical system to ensure that the power generated could be used to its full benefit. In addition, the electricity that Laughlin currently utilizes/purchases can be used by other users and there would be less demand on the electric grid during times of high demand (summer months), decreasing the opportunity for the demand to exceed the available electricity, causing brown-outs. The potential impact would be beneficial for Laughlin AFB and surrounding areas.

4.11.1.2 Traffic

During the construction of the PV solar array, there would be an increase of vehicular traffic arriving on Laughlin AFB. The construction equipment along with the infrastructure to construct the PV solar array (panels, footers, electrical lines, concrete, etc) would be required to arrive on the base through the main gate located off of U.S. Highway 90. Once equipment travels through the gate, the vehicles will be directed to stay on designated routes to ensure that normal vehicle traffic is not impeded. The increase in vehicular traffic is temporary and will occur during the duration of the construction activities. Once the construction of the PV solar array is complete and all equipment has demobilized from the site, vehicular traffic will return to pre-construction levels, thus allowing for the increase in traffic to have less than significant long-term impact.

4.11.1.3 Digital Airport Surveillance Radar

Since the electromagnetic radiation from the DASR and PV solar array are at distinct frequency levels separated by over 100 GHz in bandwidth, interference based on these frequencies are unlikely. The electromagnetic radiation is transmitted from the inverter which receives the electricity from the solar panels and transforms ii into AC. However, electromagnetic interference could potentially occur due to the frequency of the electrical current operating at 100 Hz (similar to the buzz in an AM radio that is placed too close to an electrical source). The intensity of the electromagnetic radiation decreases with distance from the inverters. To minimize the potential for interference, the inverters could be placed at the greatest allowable distance from the DASR; the allowable distance would be dependent upon the quantity of line loss. Line loss is the amount of energy lost through the transmission across power lines. Electromagnetic Interference (EMI) and Radio Frequency Interference (RFI) are similar and often have the same causes and solutions. RFI is interference or noise that is radiated - essentially, radio waves. EMI includes RFI but also includes non-radiated interference, such as line noise coming in from power or control lines. Radio waves are a type of electromagnetic radiation (Figure 4-4).

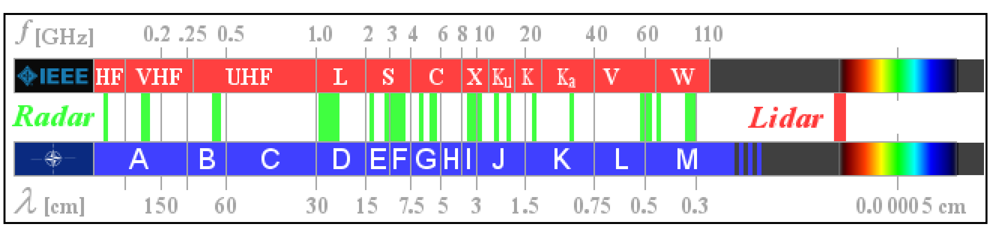

Figure 4-4 Frequency Spectrum

To minimize the potential effect of EMI the power cables would be shielded by mechanical or electrical means to prevent any effect on the DASR. There are other electrical power sources in the area as shown

on Figure 4-5. There have been no reported problems with EMI from these sources; consequently, it could be assumed that similar power from a new source would have less than significant impacts.

Figure 4-5 Overhead Electromagnetic Interference Sources

4.11.2 Alternative B – Alternate Site Alternative

4.11.2.1 Utilities

The impacts on utilities would be similar for the Alternative Site Alternative as identified for the Preferred Alternative; however, the site is located further from the base's distribution system than the Preferred Alternative site. The Alternate Site Alternative is located to the northwest of the base's distribution system, across the airfield. To transport electricity generated by the PV solar array to the distribution system, transmission lines would need to be located under the airfield by horizontal boring, and trenches would need to be dug outside the airfield. The additional trenches would cause an increase in disturbed material however the material would be returned to the trenches. The proposed PV solar array constructed would contain the same number of panels, generating the same amount of electricity, thus having the same positive impact.

4.11.2.2 Traffic

The impacts on traffic would be similar for the Alternate Site Alternative as identified for the Preferred Alternative. All traffic coming into and leaving the base would travel through the main gate increasing the traffic through the main gate during the construction phase. Similar to the Preferred Alternative, the equipment and vehicles will be directed to stay on designated routes to ensure that normal vehicle traffic will not be impacted. The increase in vehicular traffic is temporary and will occur during the duration of the construction activities, but there is no long-term impact.

4.11.2.3 Digital Airport Surveillance Radar

There would not be an impact to the DASR since the site is located two miles northeast of the DASR. However, to ensure that there is no interference with any electrical equipment, power cables will be shielded by mechanical or electrical means to prevent any effect on the DASR. There would be no significant impact.

4.11.3 Alternative C – No-Action Alternative

4.11.3.1 Utilities

If the No-Action Alternative is implemented, there would be no changes to the utility generation on the base; Laughlin AFB would continue to purchase electricity from Champion Electric; therefore, no impact to utilities would occur.

4.11.3.2 Traffic

If the No-Action Alternative is implemented, there would be no changes in the traffic on the base or roads leading to/from the base; therefore, there would be no impact to traffic.

4.11.3.3 Digital Airport Surveillance Radar

If the No-Action Alternative is implemented, there would be no changes to the wavelengths within the vicinity of the DASR; therefore there would be no impact to the DASR.

4.11.4 Measures to Reduce Impacts

To reduce the potential impact to utilities the PV solar array will be constructed and maintained to be compatible with the current electrical system. To reduce impacts to traffic, during the construction phase of the action mobilization and demobilization from the site on other base traffic, the heavy equipment (i.e., bulldozer, crane, dump trucks, backhoe, grader auger drill rig, etc.) will enter the base through the main gate off of U.S. Highway 90 to the site after 800 from off-site and leave the base after 1600. To ensure that there is not any interference with the DASR, power cables will be shielded by mechanical or electrical means.

4.12 WATER RESOURCES

Impacts to water resources resulting from the preferred or alternative actions could be significant if the activities resulted in substantial, long-term degradation of surface or groundwater water quality. Impacts could also be significant if the actions created an increase in impervious cover caused major disturbances in the natural flow, discharge, and recharge of water resources.

4.12.1 Alternative A – Preferred Alternative and Alternative B – Alternate Site Alternative

Under the Preferred Alternative and other alternatives adverse short-term and long-term effects on water resources at Laughlin AFB would be unlikely. The Unified Federal Policy for a Watershed Approach to Federal Land and Resource Management directs federal agencies to work with states, tribes, local governments, private landowners, and other interested parties to take a watershed approach to federal land and resource management. This policy guides the protection of water quality and aquatic ecosystem health by reducing polluted runoff, improving natural resources stewardship, and increasing public involvement in watershed management on federal lands. Watershed planning includes assessing and

monitoring watershed conditions and identifying priority watersheds on which to focus financial aid and other resources. Due to moderately sloping topography and the absence of any permanent water sources at either the Preferred Alternative or Alternate Site Alternative sites, water resources management is limited to controlling the velocity and volume of storm water runoff carrying sediment to the Rio Grande Watershed. Erosion control measures at Laughlin AFB are directed minimizing the runoff into Sacatosa Creek, Zorro Creek, two unnamed tributaries, and the golf course ponds.

Clearing, grading, and site preparation associated with the Preferred Alternative or Alternate Site Alternative site could potentially affect storm water runoff. Potential impacts include disruption of natural drainage patterns, contamination entering storm water discharge, or heavy sediment loading from construction activities. Mitigation measures as described in Section 4.12.3 would be implemented to reduce the potential impacts on water resources to a less than significant level.

4.12.2 Alternative C – No-Action Alternative

If the No-Action Alternative is implemented, no new impacts on water resources would occur. Impacts on water resources would be less than significant and no additional mitigation or minimization measures would be required.

4.12.3 Measures to Reduce Impacts

Preparing and implementing a Storm Water Pollution Prevention Plan (SWPPP) would minimize adverse impacts. The SWPPP would provide construction and post-construction best management practices (BMPs) intended to control and manage the loading of sediment and other pollutants to levels that would minimize degradation of downstream water quality. Compliance with Air Force Engineering Technical Letter (ETL) 03-1: Storm Water Construction Standards requires implementation of BMPs to reduce stormwater discharges and pollutant loadings to preconstruction levels or better. A stormwater control site plan would be required by the construction contractor and must contain a National Pollutant Discharge Elimination System (NPDES) permit declaration.

A negligible increase in stormwater volume would result from the reduction of pervious surfaces on the installation as a consequence of constructing concrete footings for the arrays. BMPs would be implemented to reduce post-construction runoff peak flows from the increased impervious surfaces, including post-construction grading to restore original grade to those areas where solar panel arrays are placed and trenching for conduit occurs. No solar panel arrays or conduit would be located in drainages.

Construction BMPs would also be implemented to decrease sedimentation by erosion. Common BMPs for construction activities would be followed to minimize erosion. Preventive BMPs include the following:

- Limit stockpiling of materials on-site;
- Manage stockpiled materials to minimize the time between delivery and use;
- Cover stockpiled materials with tarps;
- Install silt fences around material stockpiles, storm water drainage routes, culverts, and drains; and
- Install hay or fabric filters, netting, and mulching around material stockpiles, storm water drainage routes, culverts, and drains.

Construction would slightly increase impermeable surfaces. The construction activities and the associated slight increased amount of impervious surface would have adverse, negligible, short-term impacts on surface waters at Laughlin AFB.

All specifications and plans for proposed projects or undertakings would be reviewed for potential effects on soil stability.

Post-construction revegetation of the area down-gradient of the selected site would minimize long-term sediment loading and reduce runoff velocity to drainage channels and culverts. Indigenous vegetation, grasses, and wildflowers will be planted in areas that were disturbed around the PV panels, and crushed rock will be placed under the PV panels. These actions will decrease the potential for soil erosion and sediment loading from occurring around and under the panels.

4.13 CUMULATIVE EFFECTS

The CEQ regulations implementing the procedural provisions of NEPA define cumulative effects as follows:

> "The impact on the environment (that) results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions (40 CFR § 1508.7 [1997])."

Within the City of Del Rio, future projects have yet to be identified and the area surrounding Laughlin AFB are not zoned for a particular use, so cumulative effects from foreseeable actions related to the city of Del Rio are not present. However, Laughlin AFB has identified future projects including constructing an addition to Building 905, reconfiguring aircraft parking row CC to accommodate an additional aircraft parking space, replacing deteriorating wastewater pipelines, upgrading approach lights on the primary runway, and repositioning existing electric utility lines underground versus above ground. The projects have the potential to increase noise temporarily during site activities and the disturbance of soil during utility replacement or repositioning activities would be minimal and temporary (Air Force 2011). All of these future projects would occur within the main portion of Laughlin AFB, would not have an environmental impact, or alter the environmental baseline; thus, a cumulative effect from the Preferred Alternative and future actions is not present.

Overall, the Preferred Alternative, Alternate Site Alternative, or the No-Action Alternative would not have a long-term, negative cumulative effect on the resources at Laughlin AFB or on resources in the Val Verde County area.

4.14 UNAVOIDABLE ADVERSE IMPACTS

Unavoidable adverse impacts would result from implementation of the Preferred Alternative.

4.14.1 Biological Resources

Under the Preferred Alternative, construction activities, such as grading, excavating, and contouring of the soil, would result in vegetation removal and subsequent habitat loss for wildlife. Implementation of BMPs during and after construction, re-vegetation with native species and the limited footprint of the solar array would limit potential effects resulting from construction. Although unavoidable, these impacts on wildlife at the installation would not be considered significant.

4.15 COMPATIBILITY OF THE PROPOSED ACTION AND ALTERNATIVES WITH THE OBJECTIVES OF FEDERAL, REGIONAL, STATE, AND LOCAL LAND USE PLANS, POLICIES, AND CONTROLS

Impacts on the ground surface as a result of the Preferred Alternative would occur entirely within the boundaries of Laughlin AFB. Construction of the new PV solar array would not result in any incompatible land uses on-or-off installation. The preferred location was selected according to existing land use zones. Consequently, construction would not conflict with installation land use policies or objectives. The Preferred Alternative would not conflict with any applicable off-installation land use ordinances or designated clear zones.

4.16 RELATIONSHIP BETWEEN THE SHORT-TERM USE OF THE ENVIRONMENT AND LONG-TERM PRODUCTIVITY

Short-term uses of the biophysical components of the human environment include direct construction-related disturbances and direct impacts associated with an increase in population and activity that occurs over a period of less than 2 years. Long-term uses of the human environment include those impacts that occur over a period of more than 2 years, including permanent resource loss.

Several kinds of activities could result in short-term resource uses that compromise long-term productivity. Loss of important habitats and consumptive use of high-quality water at nonrenewable rates are examples of actions that affect long-term productivity.

The Preferred Alternative would not result in a significant intensification of land use at Laughlin AFB or the surrounding area. The Preferred Alternative does not represent a significant loss of open space (5.2 percent). Therefore, it is anticipated that the Preferred Alternative would not result in any cumulative land use or aesthetic impacts. Long-term productivity of this site would be increased by the development of the Preferred Alternative.

4.17 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

NEPA requires an analysis of significant irreversible effects. Resources that are irreversibly or irretrievably committed to a project are those that are used on a long-term or permanent basis. This includes the use of nonrenewable resources such as metal, wood, fuel, paper, and other natural or cultural resources. These resources are irretrievable in that they would be used for this project when they could have been used for other purposes. Another impact that falls under the category of the irreversible and irretrievable commitment of resources is the unavoidable destruction of natural resources that could limit the range of potential uses of that particular environment.

The irreversible environmental changes that would result from implementation of the Preferred Alternative involve the consumption of material, energy, land, biological, and human resources. The use of these resources would be permanent. Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that use of these resources would have on future generations. Irreversible effects primarily result from use or destruction of a specific resource that cannot be replaced within a reasonable time frame (e.g., energy and minerals). Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the Preferred Alternative.

4.17.1 Material Resources

Material resources irretrievably utilized for the Preferred Alternative include solar panels, concrete, and various material supplies (for infrastructure). Such materials are not in short supply, would not limit other unrelated construction activities, and their irretrievable use would not be considered significant.

4.17.2 Energy Resources

Energy resources utilized for the Preferred Alternative would be irreversibly lost. These include petroleum-based products (such as gasoline and diesel), natural gas, and electricity. During construction, gasoline and diesel would be used for the operation of construction vehicles. During operation, gasoline would be used for the operation of private and government-owned vehicles. Consumption of these energy resources would not place a significant demand on their availability in the Del Rio area.

Therefore, no significant adverse impacts would be expected. The energy produced by the solar array would provide a long term renewable energy source for Laughlin AFB, and would be considered beneficial as the expected life-savings of energy would be expected to be over 61,000 MWh (Appendix F).

4.17.3 Biological Resources

The Preferred Alternative would result in minimal, irretrievable loss of vegetation and wildlife habitat on the proposed construction site.

4.17.4 Human Resources

The use of human resources for construction and operation is considered an irretrievable loss, only in that it would preclude such personnel from engaging in other work activities. However, the use of human resources for the Preferred Alternative represents employment opportunities, and would be considered beneficial.

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7.0 ABBREVIATIONS AND ACRONYMS

AC	alternating current
AcB	Acuna silty clay
AFB	Air Force Base
AETC	Air Education and Training Command
AFI	Air Force Instruction
AFH	Air Force Handout
AICUZ	air installation compatible use zone
Air Force	United States Air Force
AOC	area of concern
AQCR	Air Quality Control Region
BCE	Base Civil Engineer
BMP	best management practices
CAA	Clean Air Act Amendments
CAR	Climate Action Registry
CEQ	Council on Environmental Quality
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CFR	Code of Federal Regulations
cfs	cubic feet per second
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalents
CWA	Clean Water Act
DASR	Digital Airport Surveillance Radar
dB	decibel
dBA	A-weighted decibel
DC	direct current
DERP	Defense Environmental Restoration Program
DMM	discarded military munitions
DoD	Department of Defense
DRMO	Defense Reutilization and Marketing Office
EA	Environmental Assessment
EIS	Environmental Impact Statement
EMI	electromagnetic interference
EO	Executive Order
EPACT	Energy Policy Act of 2005
EPCRA	Emergency Planning and Community Right-to-Know Act
ERP	Environmental Restoration Program
ESA	Endangered Species Act
ETL	engineering technical letter
^{o}F	Fahrenheit
FAA	Federal Aviation Administration

FONPA	Finding of No Practical Alternative
FONSI	Finding Of No Significant Impact
FTW	Flying Training Wing
GHG	greenhouse gases
GHz	gigahertz
GWP	global warming potential
H_2	cycles per second
Hz	Hertz
Hazmat	hazardous materials
ICRMP	Integrated Cultural Resources Management Plan
IEEE	Institute of Electrical and Electronics Engineers
ILS	Instrument Landing System
INRMP	Integrated Natural Resources Management Plan
IPCC	Intergovernmental Panel for Climate Change
ISW	industrial solid waste
kHz	kilohertz
kVA	kilovolts amperes
kWh	kilowatt hours
Ldn	day-night average noise level
MC	munitions constituents
MHz	megahertz
MMRP	Military Munitions Response Program
MSDS	material safety data sheets
MSSR	monopulse secondary surveillance radar
MSW	municipal solid waste
MVA	megavolt amperes
MW	megawatt
MWh	megawatt hours
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NEC	National Electric Code
NEI	National Emission Inventory
NEPA	National Environmental Policy Act
NEXRAD	Next Generation Radar
NFPA	National Fire Protection Association
NM	nautical mile
NO_2	nitrogen dioxide
NO_x	Nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NREL	National Renewable Energy Laboratory

NRHP	National Register of Historic Places
O_3	ozone
OSHA	Occupational Safety and Health Administration
Pb	lead
PL	Public Law
$PM_{2.5}$	particulate matter less than 2.5 microns in diameter
PM_{10}	particulate matter less than 10 microns in diameter
POL	petroleum, oils, and lubricants
PPE	personal protective equipment
ppm	parts per million
PSD	prevention of significant deterioration
PSR	primary surveillance radar
PTW	Pilot Training Wing
PV	photovoltaic
RCRA	Resource Conservation and Recovery Act
REC	renewable energy credits
RFI	radio frequency interference
ROI	region of interest
SAC	Strategic Air Command
SIP	state implementation plan
SO_2	sulfur dioxide
SUPT	Specialized Undergraduate Pilot Training
SWPPP	Storm Water Pollution Prevention Plan
TAMU	Texas A&M University
TCP	Traditional Cultural Properties
TCEQ	Texas Council on Environmental Quality
THz	terahertz
tpy	tons per year
TPWD	Texas Parks and Wildlife Department
TSCA	Toxic Substance Control Act
UPS	uninterrupted power supply
U.S.	United States
USACE	United States Army Corps of Engineers
USC	United States Code
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Service
UXO	unexploded ordnance
V	volts
VOC	volatile organic compounds
ZaC	Zapata-Vinegarroon complex

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8.0 DISTRIBUTION LIST

Mr. Mark Wolfe
State Historic Preservation Officer (SHPO)
Texas Historical Commission
P.O. Box 12276
Austin, TX 78711

Mr. David A. Ramirez
Texas Commission On Environmental Quality (TCEQ)
707 E. Calton Road
Suite 304
Laredo, TX 78041-3887

Mr. Juan Garza
Kickapoo Traditional Tribe of Texas
Kickapoo Traditional Council
P.O. Box 972
Eagle Pass, TX 78853

City of Del Rio
Planning Department
109 West Broadway
Del Rio, TX 78840

U.S. Fish & Wildlife Service (USFWS)
Southwest Region
P.O. Box 1306
Albuquerque, NM 87103-1306

Texas Parks and Wildlife Department (TPWD)
4200 Smith School Road
Austin, TX 78744

Val Verde County Public Library
300 Spring Street
Del Rio, TX 78840

National Park Service
12795 Alameda Parkway
Denver, CO 80225-0287

Mr. Gene Moore
47 CES/CEAN
251 4th Street, Building 100
Laughlin AFB, TX 78840

Ms. Carmen Minerva
AETC CONS/LGCD
2021 First Street West
Randolph AFB, TX 78150-4302

APPENDIX A – AF 813

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REQUEST FOR ENVIRONMENTAL IMPACT ANALYSIS		*Report Control Symbol* RCS:
INSTRUCTIONS: *Section I to be completed by Proponent; Sections II and III to be completed by Environmental Planning Function. Continue on separate sheets as necessary. Reference appropriate item number(s).*		
SECTION I - PROPONENT INFORMATION		
1. TO *(Environmental Planning Function)* 47ISS/CEAN	2. FROM *(Proponent organization and functional address symbol)* 47ISS/CEPD	2a. TELEPHONE NO. 5064
3. TITLE OF PROPOSED ACTION (MXDP091023) ENERGY-INSTALL PHOTO VOLTAIC ARRAY		
4. PURPOSE AND NEED FOR ACTION *(Identify decision to be made and need date)* See back of form		
5. DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES *(DOPAA) (Provide sufficient details for evaluation of the total action.)* See back of form		
6. PROPONENT APPROVAL *(Name and Grade)* DANNY L. YANDELL GS-11	6a. SIGNATURE Danny L Yandell	6b. DATE MAR 30 2010

SECTION II - PRELIMINARY ENVIRONMENTAL SURVEY. *(Check appropriate box and describe potential environmental effects Including cumulative effects.) (+ = positive effect; 0 = no effect; − = adverse effect; U= unknown effect)*	+	0	-	U
7. AIR INSTALLATION COMPATIBLE USE ZONE/LAND USE *(Noise, accident potential, encroachment, etc.)*	☐	☒	☐	☐
8. AIR QUALITY *(Emissions, attainment status, state implementation plan, etc.)*	☐	☒	☐	☐
9. WATER RESOURCES *(Quality, quantity, source, etc.)*	☐	☒	☐	☐
10. SAFETY AND OCCUPATIONAL HEALTH *(Asbestos/radiation/chemical exposure, explosives safety quantity-distance, bird/wildlife aircraft hazard, etc.)*	☐	☒	☐	☐
11. HAZARDOUS MATERIALS/WASTE *(Use/storage/generation, solid waste, etc.)*	☐	☒	☐	☐
12. BIOLOGICAL RESOURCES *(Wetlands/floodplains, threatened or endangered species, etc.)*	☐	☒	☐	☐
13. CULTURAL RESOURCES *(Native American burial sites, archaeological, historical, etc.)*	☐	☒	☐	☐
14. GEOLOGY AND SOILS *(Topography, minerals, geothermal, Installation Restoration Program, seismicity, etc.)*	☐	☒	☐	☐
15. SOCIOECONOMIC *(Employment/population projections, school and local fiscal impacts, etc.)*	☐	☒	☐	☐
16. OTHER *(Potential impacts not addressed above.)* Energy Conservation Project	☒	☐	☐	☐

SECTION III - ENVIRONMENTAL ANALYSIS DETERMINATION

17. ☐ PROPOSED ACTION QUALIFIES FOR CATEGORICAL EXCLUSION (CATEX) # ______________ ; OR

☒ PROPOSED ACTION DOES NOT QUALIFY FOR A CATEX; FURTHER ENVIRONMENTAL ANALYSIS IS REQUIRED.

18. REMARKS

19. ENVIRONMENTAL PLANNING FUNCTION CERTIFICATION *(Name and Grade)* Gene Moore YF-02	19a. SIGNATURE Gene Moore	19b. DATE 30 Mar 10

4(CONT): The base currently purchases electricity from the Texas General Land Office at a negotiated rate. This electricity is produced from the consumption and processing of fossil fuels, which is costly and adversely impacts the environment. The use of alternative, energy-producing sources is a major initiative directed by the Air Force for the reduction of costs and the elimination/reduction of the use of limited fossil fuels. Failure to provide this project will result in the base continuing to purchase electricity at a higher cost than could be provided by this project. The base will not be able to realize any cost savings and will continue to be a consumer of the limited supply of environmentally harmful fossil fuels.

5(CONT): Provide all labor, equipment and materials to install, manage, operate and maintain a photovoltaic (PV) array on approximately 75 acres of unimproved base land. Land use will include a lease in kind as appropriate. Project will include all work required to install the PV array for solar power generation and connection to the base primary electrical sub-station.
The intent of the project is to build a partnership that provides electricity to the base at a greatly reduced and guaranteed cost for a specified period of time..

APPENDIX B – INTERGOVERNMENTAL/INTERAGENCY COORDINATION AND PUBLIC PARTICIPATION

DEPARTMENT OF THE AIR FORCE

47TH FLYING TRAINING WING (AETC)

Colonel Michael R. Frankel
Commander, 47th Flying Training Wing
561 Liberty Drive, Suite 1
Laughlin AFB, TX 78843-5230

State Historical Preservation Officer
Texas Historical Commission
Mark Wolfe
PO Box 12276
Austin, TX 78711

Dear Mr. Wolfe,

1. The United States Air Force (USAF) is preparing an Environmental Assessment (EA) for the construction and operation of a Photovoltaic (PV) solar array on Laughlin Air Force Base, Texas. The PV solar array would be located within an 85 acre, undeveloped area, in the western portion of Laughlin Air Force Base and would be capable of generating up to 10-megawatts of electricity. Per the Council on Environmental Quality guidelines pursuant to the National Environmental Policy Act of 1969, the enclosed Draft EA describes the action and the potential affect on the environment based upon the action. In accordance with Executive Order 12372, Intergovernmental Review of Federal Programs, your review and comments of the enclosed Draft EA would be appreciated.

2. If you have any questions regarding this Draft EA, please contact our consultant Tetra Tech, Inc. The point of contact at Tetra Tech, Inc is Mrs. Jennifer Peters, and she can be reached at (210) 226-2922. We will receive comments 30-days from the Public Notice. If you have any written comments concerning the Draft EA, please contact Mr. Gene More, Environmental Flight Chief, at the following address:

47 CES/CEAN
251 Fourth Street, Building 100
Laughlin AFB, Texas 78843

Sincerely,

MICHAEL R. FRANKEL, Colonel, USAF
Commander, 47th Flying Training Wing

Attachment:
Draft Environmental Assessment

DEPARTMENT OF THE AIR FORCE
47TH FLYING TRAINING WING (AETC)

Colonel Michael R. Frankel
Commander, 47th Flying Training Wing
561 Liberty Drive, Suite 1
Laughlin AFB, TX 78843-5230

Texas Commission on Environmental Quality
David A. Ramirez
707 E. Calton Road, Suite 304
Laredo, TX 78041-3887

Dear Mr. Ramirez,

1. The United States Air Force (USAF) is preparing an Environmental Assessment (EA) for the construction and operation of a Photovoltaic (PV) solar array on Laughlin Air Force Base, Texas. The PV solar array would be located within an 85 acre, undeveloped area, in the western portion of Laughlin Air Force Base and would be capable of generating up to 10-megawatts of electricity. Per the Council on Environmental Quality guidelines pursuant to the National Environmental Policy Act of 1969, the enclosed Draft EA describes the action and the potential affect on the environment based upon the action. In accordance with Executive Order 12372, Intergovernmental Review of Federal Programs, your review and comments of the enclosed Draft EA would be appreciated.

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251 Fourth Street, Building 100
Laughlin AFB, Texas 78843

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MICHAEL R. FRANKEL, Colonel, USAF
Commander, 47th Flying Training Wing

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Draft Environmental Assessment

DEPARTMENT OF THE AIR FORCE
47TH FLYING TRAINING WING (AETC)

Colonel Michael R. Frankel
Commander, 47th Flying Training Wing
561 Liberty Drive, Suite 1
Laughlin AFB, TX 78843-5230

City of Del Rio
Planning Department
Janice Pokrant
109 West Broadway
Del Rio, TX 78840

Dear Ms. Pokrant,

1. The United States Air Force (USAF) is preparing an Environmental Assessment (EA) for the construction and operation of a Photovoltaic (PV) solar array on Laughlin Air Force Base, Texas. The PV solar array would be located within an 85 acre, undeveloped area, in the western portion of Laughlin Air Force Base and would be capable of generating up to 10-megawatts of electricity. Per the Council on Environmental Quality guidelines pursuant to the National Environmental Policy Act of 1969, the enclosed Draft EA describes the action and the potential affect on the environment based upon the action. In accordance with Executive Order 12372, Intergovernmental Review of Federal Programs, your review and comments of the enclosed Draft EA would be appreciated.

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Laughlin AFB, Texas 78843

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MICHAEL R. FRANKEL, Colonel, USAF
Commander, 47th Flying Training Wing

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Draft Environmental Assessment

DEPARTMENT OF THE AIR FORCE
47TH FLYING TRAINING WING (AETC)

Colonel Michael R. Frankel
Commander, 47th Flying Training Wing
561 Liberty Drive, Suite 1
Laughlin AFB, TX 78843-5230

U.S. Fish and Wildlife Service
Southwest Region
Dr. Benjamin Tuggle
Regional Director
PO Box 1306
Albuquerque, NM 87103-1305

Dear Dr. Tuggle,

1. The United States Air Force (USAF) is preparing an Environmental Assessment (EA) for the construction and operation of a Photovoltaic (PV) solar array on Laughlin Air Force Base, Texas. The PV solar array would be located within an 85 acre, undeveloped area, in the western portion of Laughlin Air Force Base and would be capable of generating up to 10-megawatts of electricity. Per the Council on Environmental Quality guidelines pursuant to the National Environmental Policy Act of 1969, the enclosed Draft EA describes the action and the potential affect on the environment based upon the action. In accordance with Executive Order 12372, Intergovernmental Review of Federal Programs, your review and comments of the enclosed Draft EA would be appreciated.

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251 Fourth Street, Building 100
Laughlin AFB, Texas 78843

Sincerely,

MICHAEL R. FRANKEL, Colonel, USAF
Commander, 47th Flying Training Wing

Attachment:
Draft Environmental Assessment

DEPARTMENT OF THE AIR FORCE

47TH FLYING TRAINING WING (AETC)

Colonel Michael R. Frankel
Commander, 47th Flying Training Wing
561 Liberty Drive, Suite 1
Laughlin AFB, TX 78843-5230

Texas Parks and Wildlife
NEPA Coordinator
4200 Smith School Road
Austin, TX 78744

Dear NEPA Coordinator,

1. The United States Air Force (USAF) is preparing an Environmental Assessment (EA) for the construction and operation of a Photovoltaic (PV) solar array on Laughlin Air Force Base, Texas. The PV solar array would be located within an 85 acre, undeveloped area, in the western portion of Laughlin Air Force Base and would be capable of generating up to 10-megawatts of electricity. Per the Council on Environmental Quality guidelines pursuant to the National Environmental Policy Act of 1969, the enclosed Draft EA describes the action and the potential affect on the environment based upon the action. In accordance with Executive Order 12372, Intergovernmental Review of Federal Programs, your review and comments of the enclosed Draft EA would be appreciated.

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251 Fourth Street, Building 100
Laughlin AFB, Texas 78843

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MICHAEL R. FRANKEL, Colonel, USAF
Commander, 47th Flying Training Wing

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Draft Environmental Assessment

DEPARTMENT OF THE AIR FORCE
47TH FLYING TRAINING WING (AETC)

Colonel Michael R. Frankel
Commander, 47th Flying Training Wing
561 Liberty Drive, Suite 1
Laughlin AFB, TX 78843-5230

National Park Service
NEPA Coordinator
12795 Alameda Parkway
Denver, CO 80225-0287

Dear NEPA Coordinator,

1. The United States Air Force (USAF) is preparing an Environmental Assessment (EA) for the construction and operation of a Photovoltaic (PV) solar array on Laughlin Air Force Base, Texas. The PV solar array would be located within an 85 acre, undeveloped area, in the western portion of Laughlin Air Force Base and would be capable of generating up to 10-megawatts of electricity. Per the Council on Environmental Quality guidelines pursuant to the National Environmental Policy Act of 1969, the enclosed Draft EA describes the action and the potential affect on the environment based upon the action. In accordance with Executive Order 12372, Intergovernmental Review of Federal Programs, your review and comments of the enclosed Draft EA would be appreciated.

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47 CES/CEAN
251 Fourth Street, Building 100
Laughlin AFB, Texas 78843

We will receive comments through 31 March 2011.

Sincerely,

MICHAEL R. FRANKEL, Colonel, USAF
Commander, 47th Flying Training Wing

Attachment:
Draft Environmental Assessment

DEPARTMENT OF THE AIR FORCE
47TH FLYING TRAINING WING (AETC)

Colonel Michael R. Frankel
Commander, 47th Flying Training Wing
561 Liberty Drive, Suite 1
Laughlin AFB, TX 78843-5230

Mr. Juan Garza
Kickapoo Traditional Tribe of Texas
Kickapoo Traditional Council
P.O. Box 972
Eagle Pass, Texas 78853

Dear Mr. Garza,

1. The United States Air Force (USAF) is preparing an Environmental Assessment (EA) for the construction and operation of a Photovoltaic (PV) solar array on Laughlin Air Force Base, Texas. The PV solar array would be located within an 85 acre, undeveloped area, in the western portion of Laughlin Air Force Base and would be capable of generating up to 10-megawatts of electricity. Per the Council on Environmental Quality guidelines pursuant to the National Environmental Policy Act of 1969, the enclosed Draft EA describes the action and the potential affect on the environment based upon the action. In accordance with Executive Order 12372, Intergovernmental Review of Federal Programs, your review and comments of the enclosed Draft EA would be appreciated.

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47 CES/CEAN
251 Fourth Street, Building 100
Laughlin AFB, Texas 78843

Sincerely,

MICHAEL R. FRANKEL, Colonel, USAF
Commander, 47th Flying Training Wing

Attachment:
Draft Environmental Assessment

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August 22, 2011

Mr. Gene Moore
Environmental Chief
47 CES/CEAN
251 Fourth Street, Building 100
Laughlin AFB, TX 78843

Re: Environmental Assessment for the construction and operation of a Photovoltaic Solar Array on Laughlin AFB

Dear Mr. Moore:

Thank you for your correspondence describing the above referenced project. This letter serves as comment on the proposed undertaking from the State Historic Preservation Officer, the Executive Director of the Texas Historical Commission (THC).

Our review staff, led by William McWhorter has reviewed your submission of the above mentioned Environmental Assessment (EA) for the construction and operation of a Photovoltaic Solar Array at Laughlin AFB, and agree with the Department of the Air Force's findings of **"NO HISTORIC PROPERTIES AFFECTED,"** with respect to structures located at Laughlin AFB and this project's specific undertaking.

However, our Archeological Division staff has determined that Archeological site 41VV1682 is located within the boundaries of the Alternative B – Alternate Site, but was not included in the cultural resources discussion in Section 3.4 of the Draft EA. For the Final EA, please discuss this site, and research any eligibility determinations, additional archeological testing or avoidance that may be warranted.

Thank you for your cooperation in this state and federal review process, and for your efforts to preserve the irreplaceable heritage of Texas. If you have any questions concerning our review or if we may be of further assistance, please contact Mr. William McWhorter at 512/463-5833.

Sincerely,

William McWhorter

for
Mark Wolfe,
Executive Director

TEXAS PARKS & WILDLIFE

Life's better outside.®

September 12, 2011

Gene Moore
47 CES/CEAN
251 Forth Street, Building 100
Laughlin AFB, TX 78843

RE: Draft EA for proposed solar array on Laughlin AFB, Val Verde County, Texas.

Dear Mr. Moore:

Texas Parks and Wildlife Department (TPWD) received your request for review of the draft environmental assessment (EA) prepared for the project referenced above.

Project Description

The proposed project would involve installing between 41,000 and 131,000 photovoltaic solar panels aligned in south-facing arrays. The array footings would be embedded in concrete. A 10,000 square foot building would be constructed to house batteries, inverters and other equipment; the building would not have water or waste lines or heat. The entire solar panel array would be enclosed by a security fence. Solar panels would be cleaned regularly with water, compressed air or a combination of both. Two sites identified as the "Preferred Alternative Site" and the "Alternate Site Alternative Site" would be considered as well as the no action alternative.

The Preferred Site is on the western edge of Laughlin Air Force Base (AFB) and is reported to be approximately 85 acres in size. The Alternate Site is along the northeast corner of the AFB and is reported to be approximately 75 acres in size.

Rare Species Review

Based on the project as presented, the TPWD annotated county list of rare species for Val Verde County, and presently known Texas Natural Diversity Database (TXNDD) records for the general project area, the following listed species could be impacted by proposed project activities *if suitable habitat* is present:

Federal Listed Endangered
Black-capped Vireo (*Vireo atricapilla*)
Tobusch fishhook cactus (*Sclerocactus brevihamatus* subsp *tobuschii*)

State Listed Threatened
* Black bear (*Ursus americanus*)
Reticulate collared lizard (*Crotaphytus reticulatus*)
* Texas horned lizard (*Phrynosoma cornutum*)
Texas indigo snake (*Drymarchon melanurus erebennus*)
Texas tortoise (*Gopherus berlandieri*)
Texas Pecos black-headed snake (*Tantilla cucullata*)

4200 SMITH SCHOOL ROAD
AUSTIN, TEXAS 78744-3291
512.389.4800
www.tpwd.state.tx.us

Species of Concern

Ferruginous Hawk (*Buteo regalis*)
Audubon's Oriole (*Icterus graduacaud audubonii*)
* Mexican Hooded Oriole (*Icterus cucullatus cucullatus*)
Montezuma Quail (*Cyrtonyx montezumae*)
Western Burrowing Owl (*Athene cunicularia hypugaea*)
Zoned-tailed Hawk (*Buteo albonotatus*)
Texas pocket gopher (*Geomys personatus fuscus*)
* Western yellow bat (*Lasiurus xanthinus*)
Spot-tailed earless lizard (*Holbrookia lacerata*)
Correll's false dragon-head (*Physostegia correllii*)
Dwarf broomspurge (*Chamaesyce jejuna*)
* Longstalk heimia (*Nesaea longipes*)
* Rydberg's scurfpea (*Pediomelum humile*)
* Texas trumpets (*Acleisanthes crassifolia*)
Wright's trumpets (*Acleisanthes wrightii*)
Wright's water-willow (*Justicia wrightii*)

Data from the TXNDD has documented occurrences of the species shown above, preceded by an asterisk, on and/or possibly within 1.5 miles of one or both of the possible project sites. Printouts for these occurrence records and maps of both alternative project sites are included for your planning reference.

Please be aware that the TXNDD is intended to assist users in avoiding harm to rare species or significant ecological features. Absence of information in an area does not imply that a species is absent from that area. Given the small proportion of public versus private land in Texas, the TXNDD does not include a representative inventory of rare resources in the state. Although it is based on the best data available to TPWD regarding rare species, the data from the TXNDD do not provide a definitive statement as to the presences, absence or condition of special species, natural communities, or other significant features within your project area. These data are not inclusive and **cannot be used as presence/absence data**. They represent species that could potentially be in your project area. This information cannot be substituted for on-the-ground surveys.

Please review the most current TPWD county lists for Val Verde County, as other rare species could be present depending upon habitat availability. These lists are available online at http://www.tpwd.state.tx.us/landwater/land/maps/gis/ris/endangered_species/index.phtml.

For the U.S. Fish and Wildlife Service (USFWS) rare species lists please visit: http://eco.fws.gov/tess_public/serviet/gov.doi.tess_public.serviets.EntryPage.

Federal Regulations

Sikes Act Improvement Act of 1997

The Sikes Act Improvement Act of 1997 mandates that all Department of Defense (DOD) installations containing significant natural resources have an Integrated Natural Resource Management Plan (INRMP) implemented by 17 November 2001. The INRMP facilitates the program that the Sikes Act authorizes which provides for conservation and rehabilitation of natural resources that occur on military installations. Provided the military mission is not impeded, in Texas INRMPs are to be developed as a cooperative effort between the military, the USFWS, and TPWD and include elements of fish, wildlife and habitat management, habitat enhancement and outdoor recreational opportunities.

> **Recommendation:** Significant rare plant resources occur on or near Laughlin AFB. Only 10 viable populations of Texas trumpets (*Acleisanthes crassifolia*) are known to occur in Texas. Most of these known populations occur in highway right-of-ways and therefore are unprotected and subject to being permanently negatively impacted. Per the conservation measures required by the Sikes Act, TPWD encourages Laughlin AFB to preserve one of the only populations of Texas trumpets in the state that is currently offered some level of protection by occurring on a managed land.

Endangered Species Act (ESA)

Federally-listed animal species and their habitat are protected from "take" on any property by the ESA. Take of a federally-listed species can be allowed if it is "incidental" to an otherwise lawful activity and must be permitted in accordance with Section 7 or 10 of the ESA. Federally-listed plants are not protected from take except on lands under federal/state jurisdiction or for which a federal/state nexus (i.e., permits or funding) exists. Any take of a federally listed species or its habitat without the required take permit (or allowance) from the USFWS is a violation of the ESA.

> **Recommendation:** The draft EA states that surveys for federally listed species were conducted in preparation of the document and that Black-capped Vireos were observed on Laughlin AFB. The Vireos were determined to be migratory. Nonetheless, if the Preferred Site is selected as the site to construct the solar arrays and construction (*i.e.*, ground clearing) would occur during nesting/migratory season, TPWD recommends conducting surveys to ensure Black-capped Vireos are not present prior to commencing construction.

Migratory Bird Treaty Act (MBTA)

The Migratory Bird Treaty Act (MBTA) implicitly prohibits intentional *and unintentional* take of migratory birds, including their nests and eggs, except as permitted by the USFWS. Although not documented in the TXNDD or protected by

the ESA, many bird species that are protected by the MBTA are known to reside in or migrate through the potential project areas.

Due to the occurrence of brush, grassland, and natural and manmade aquatic habitats on Laughlin AFB, the project sites could support a high diversity of bird species. Multiple occurrences of the Mexican Hooded Oriole, a state species of concern, have been documented on Laughlin AFB near both potential project sites. Due to the diversity of brush species at the Preferred Site, it could support a greater diversity of birds than the Alternate Site.

> **Recommendation:** TPWD recommends avoiding or minimizing clearing brush from the previously undeveloped areas of Laughlin AFB. For required clearing, TPWD recommends scheduling all vegetation clearing or trampling outside of the April 1-July 15 migratory bird nesting season in order to fully comply with the MBTA. Contractors should be made aware of the potential of encountering migratory birds (either nesting or wintering) at the proposed project sites and be instructed to avoid negatively impacting them. Please contact the U.S. Fish and Wildlife Service Southwest Regional Office (Region 2) at (505) 248-6879 for more information regarding the MBTA.

<u>State regulations</u>

Parks and Wildlife Code

State law prohibits any take (incidental or otherwise) of state-listed species. Laws and regulations pertaining to state-listed endangered or threatened animals are contained in Chapters 67 and 68 of the Texas Parks and Wildlife (TPW) Code; laws pertaining to endangered or threatened plants are contained in Chapters 88 of the TPW Code.

As mentioned above, occurrences of state-listed threatened and species of concern have been documented on Laughlin AFB; some within or near the boundaries of both the Preferred and Alternate Sites. The project areas and adjacent habitat types provide food, browse, and cover for many species of wildlife, including state-listed species. The availability of vegetated cover at the Preferred Site that includes leguminous species can support many bird species as well as state-listed reptiles adapted to arid environments (*e.g.*, reticulate collared lizard, Texas indigo snake) and prey species (*e.g.*, lizards, mice) for raptors common in the area.

> **Recommendation:** If the Preferred Site Alternative is selected as the site to construct the solar array, TPWD recommends that the population of Texas trumpets (*Acleisanthes crassifolia*) be protected by excluding the area they occupy from development. To ensure the plants are not inadvertently cleared, construction fencing should be placed around them prior to construction. As mentioned previously, this plant is subject to extirpation without preservation and/or conservation efforts to protect it.

TPWD recommends that if encountered, wildlife including state-listed species, should be avoided and permitted to leave the project area on their own.

Texas tortoises could be encountered at either of the proposed project sites. TPWD recommends that if encountered, Texas tortoises should be avoided and permitted to leave the project area on their own. Attempting to relocate them by picking them up can cause them to evacuate their bladders. Evacuation of their bladder, along with the stress of being moved, could cause the tortoises to become dehydrated and die.

Because snakes are generally perceived as a threat and killed when encountered during clearing or construction, TPWD recommends contractors be advised that many snakes, including the protected Texas indigo snake, have been documented in Val Verde County. Contractors should be advised to avoid impacts to snakes as long as the safety of the workers is not compromised. Western diamondback rattlesnakes also occur in Val Verde County. Contractors should avoid contact with this species if encountered and allow the snake to safely leave the work area.

Please note that relocating any state-listed species requires a scientific collection permit. This can be obtained from TPWD Wildlife Permits Program. For more information regarding this permit, please visit TPWD's wildlife permit website at: http://www.tpwd.state.tx.us/business/permits/land/wildlife/

If, during construction, the project area is found to contain rare species, natural plant communities or special features, TPWD recommends that precautions be taken to avoid, minimize, and compensate for impacts to them.

Alternatives

The Preferred Site Alternative is characteristic of Ceniza-Blackbrush-Creosote Brush vegetation as defined by the Vegetation Types of Texas. The diverse mixture of native shrubs and brush adjacent to a large undeveloped tract of land between Laughlin AFB and the Rio Grande provides high quality habitat for wildlife. A population of Texas trumpets, a plant species of concern determined to be "imperiled in the state, very rare, vulnerable to extirpation" occurs within the defined boundary of the Preferred Site Alternative.

The Alternate Site Alternative consists of a field of grasses and invasive weeds that provide little wildlife habitat.

Recommendation: Based on potential impacts to wildlife and the potential removal of an extant population of an imperiled plant associated with the

proposed development of the Preferred Site Alternative, TPWD does not support the Preferred Site Alternative as the recommended alternative. TPWD recommends the Alternate Site Alternative be selected as the site to construct the photovoltaic solar arrays.

General Comments

The Draft EA identifies the Preferred Site Alternative as being approximately 85 acres in size; however, the defined boundary provided on the maps in the Draft EA and verified using ArcGIS software indicates that site encompasses more than 150 acres. Similarly, the Draft EA identifies the Alternate Site Alternative as approximately 75 acres in size; however, the defined boundary provided on the maps in the Draft EA encompasses approximately 250 acres.

Page 3-11, Line 1. For consistency and accuracy, Indigo snake (*Drymarchon corias*) should be changed to Texas indigo snake (*Drymarchon melanurus erebennus*).

Page 4-17, Line 15-16. This section is discussing Alternative B; however, line 15 states that "…implementation of Alternative A an adverse…" It appears that this statement should say "Alternative B."

Thank you for the opportunity to review and comment on this proposed project. Please contact me at (361) 825-3240 if you have any questions regarding our comments.

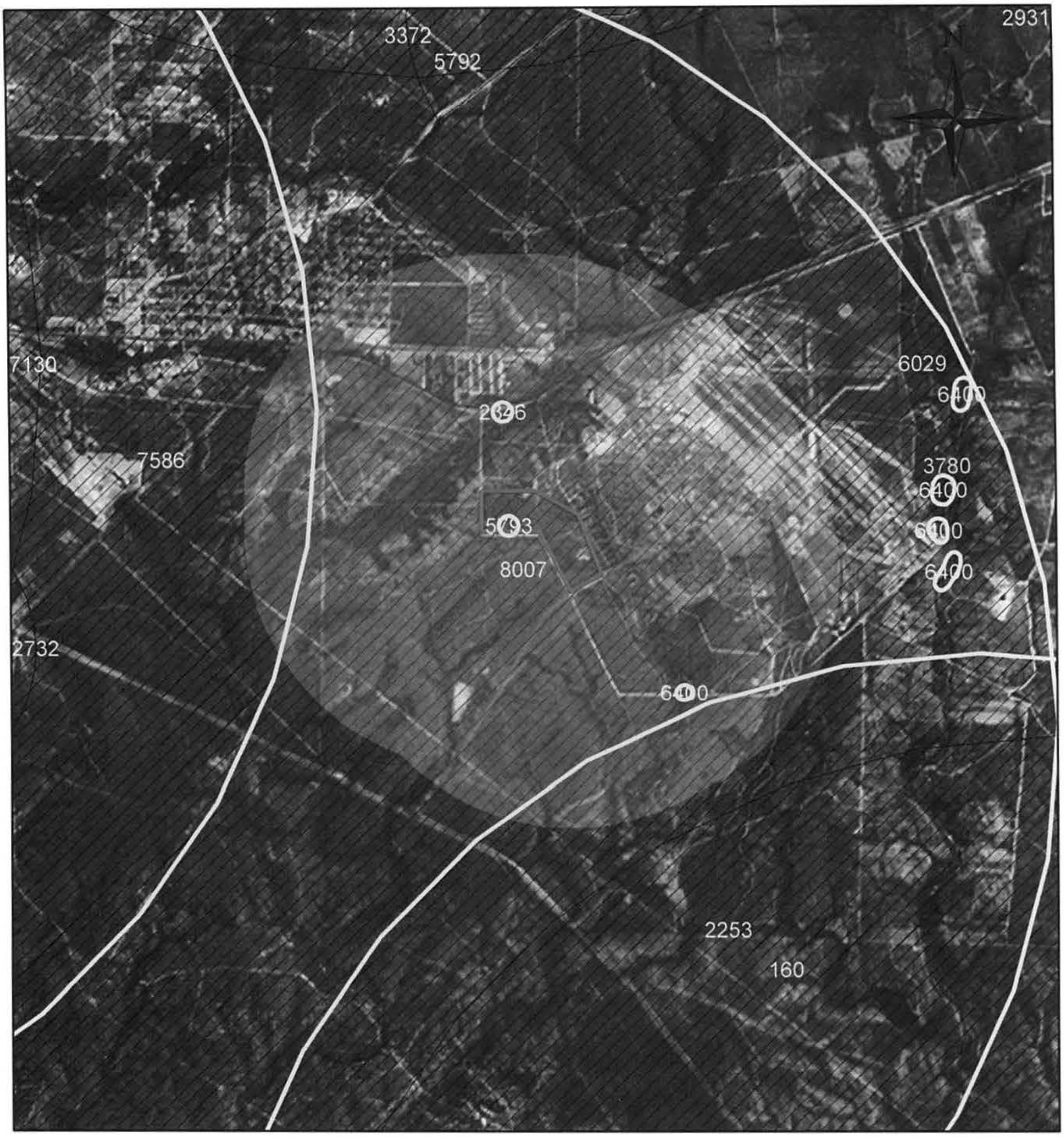
Sincerely,

Russell Hooten

Russell Hooten
Wildlife Habitat Assessment Program
Wildlife Division

/rh 16442

Attachments



Rare Resources near Preferred Location Laughlin AFB, Val Verde County, Texas

Preferred location

1.5-mile Buffer Preferred Location

Element Occurrrence ID#

TEXAS PARKS & WILDLIFE

Rare Resources near Alternate Location Laughlin AFB, Val Verde County, Texas

Alt. location

1.5-mile Buffer Alt location

Element Occurrrence ID#

TEXAS PARKS & WILDLIFE

Code Key for Printouts from Texas Parks and Wildlife Department Texas Natural Diversity Database (TXNDD)

This information is for your assistance only; due to continuing data updates, vulnerability of private land to trespass and of species to disturbance or collection, please refer all requesters to our office to obtain the most current information available. Also, please note, identification of a species in a given area does not necessarily mean the species currently exists at the point or area indicated.

LEGAL STATUS AND CONSERVATION RANKS

FEDERAL STATUS (as determined by the US Fish and Wildlife Service)

LE	Listed Endangered
LT	Listed Threatened
PE	Proposed to be listed Endangered
PT	Proposed to be listed Threatened
PDL	Proposed to be Delisted (Note: Listing status retained while proposed)
SAE, SAT	Listed Endangered on basis of Similarity of Appearance, Listed Threatened on basis of Similarity of Appearance
DL	Delisted Endangered/Threatened
C	Candidate. USFWS has substantial information on biological vulnerability and threats to support proposing to list as threatened or endangered. Data are being gathered on habitat needs and/or critical habitat designations.
C*	C, but lacking known occurrences
C**	C, but lacking known occurrences, except in captivity/cultivation
XE	Essential Experimental Population
XN	Non-essential Experimental Population
Blank	Species is not federally listed

TX PROTECTION (as determined by the Texas Parks and Wildlife Department)

E	Listed Endangered
T	Listed Threatened
Blank	Species not state-listed

GLOBAL RANK (as determined by NatureServe)

G1	Critically imperiled globally, extremely rare, typically 5 or fewer viable occurrences
G2	Imperiled globally, very rare, typically 6 to 20 viable occurrences
G3	Very rare and local throughout range or found locally in restricted range, typically 21 to 100 viable occurrences
G4	Apparently secure globally
G5	Demonstrably secure globally
GH	Of historical occurrence through its range
GU	Possibly in peril range-wide, but status uncertain
G#G#	Ranked within a range as status uncertain
GX	Apparently extinct throughout range
Q	Rank qualifier denoting taxonomic assignment is questionable
#?	Rank qualifier denoting uncertain rank
C	In captivity or cultivation only
G#T#	"G" refers to species rank; "T" refers to variety or subspecies rank

STATE (SUBNATIONAL) RANK (as determined by the Texas Parks and Wildlife Department)

S1	Critically imperiled in state, extremely rare, vulnerable to extirpation, typically 5 or fewer viable occurrences
S2	Imperiled in state, very rare, vulnerable to extirpation, typically 6 to 20 viable occurrences
S3	Rare or uncommon in state, typically 21 to 100 viable occurrences
S4	Apparently secure in State
S5	Demonstrably secure in State
S#S#	Ranked within a range as status uncertain
SH	Of historical occurrence in state and may be rediscovered
SU	Unrankable – due to lack of information or substantially conflicting information
SX	Apparently extirpated from State
SNR	Unranked – State status not yet assessed
SNA	Not applicable – species id not a suitable target for conservation activities
?	Rank qualifier denoting uncertain rank in State

ELEMENT OCCURRENCE RECORD

Element Occurrence Record (EOR)	Spatial and tabular record of an area of land and/or water in which a species, natural community, or other significant feature of natural diversity is, or was, present and associated information; may be a single contiguous area or may be comprised of discrete patches or subpopulations
Occurrence #	Unique number assigned to each occurrence of each element when added to the NDD

LOCATION INFORMATION

Watershed Code	Eight digit numerical code determined by US Geological Survey (USGS)
Watershed	Name of watershed as determined by USGS
Quadrangle	Name of USGS topographical map
Directions	Directions to geographic location where occurrence was observed, as described by observer or in source

SURVEY INFORMATION

First/Last Observation	Date a particular occurrence was first/last observed; refers only to species occurrence as noted in source and does not imply the first/last date the species was present
Survey Date	If conducted, date of survey

EO Type — State rank qualifiers:

M	Migrant – species occurring regularly on migration at staging areas, or concentration along particular corridors; status refers to the transient population in the State
B	Qualifier indicating basic rank refers to the breeding population in State
N	Qualifier indicating basic rank refers to the non-breeding population in State

EO Rank

A	Excellent	AI	Excellent, Introduced
B	Good	BI	Good, Introduced
C	Marginal	CI	Marginal, Introduced
D	Poor	DI	Poor, Introduced
E	Extant/Present	EI	Extant, Introduced
H	Historical/No Field Information	HI	Historical, Introduced
X	Destroyed/Extirpated	XI	Destroyed, Introduced
O	Obscure	OI	Obscure, Introduced

EO Rank Date	Latest date EO rank was determined or revised
Observed Area	Acres, unless indicated otherwise

COMMENTS

Description	General physical description of area and habitat where occurrence is located, including associated species, soils, geology, and surrounding land use
Comments	Comments concerning the quality or condition of the element occurrence at time of survey
Protection Comments	Observer comments concerning legal protection of the occurrence
Management Comments	Observer comments concerning management recommendations appropriate for occurrence conservation

DATA

EO Data	Biological data; may include number of individuals, vigor, flowering/fruiting data, nest success, behaviors observed, or unusual characteristic, etc.

SITE

Site Name	Title given to site by surveyor

MANAGED AREA INFORMATION

Managed Area Name	Place name or (on EOR printout) name of area when the EO is located within or partially within an area identified for conservation, such as State or Federal lands, nature preserves, parks, etc.
Alias	Additional names the property is known by
Acres	Total acreage of property, including non-contiguous tracts
Manager	Contact name, address, and telephone number for area or nearest area land steward

Please use one of the following citations to credit the source for the printout information:

Texas Natural Diversity Database. [year of printouts]. Wildlife Diversity Program of Texas Parks & Wildlife Department. [day month year of printouts].

Texas Natural Diversity Database. [year of printouts]. Element occurrence printouts for [scientific name] *records # [occurrence number(s)]. Wildlife Diversity Program of Texas Parks & Wildlife Department. [day month year of printouts]. *Use of record #'s is optional.

Revised 1 Apr 200

Element Occurrence Record

Scientific Name: *Pediomelum humile* **Occurrence #:** 7 **Eo Id:** 8007

Common Name: Rydberg's scurfpea **TX Protection Status:** **ID Confirmed:** Y

Global Rank: G1 **State Rank:** S1 **Federal Status:**

Location Information:

Watershed Code:	Watershed Description:
13080001	Elm-Sycamore

County Code:	County Name:	Mapsheet Code:	Mapsheet Name:	State:
TXVALV	Val Verde	29100-C7	Del Rio SE	TX

Directions:

SOUTH OF DEL RIO

Survey Information:

First Observation: 1994-04-15 **Survey Date:** **Last Observation:** 1994-04-15

Eo Type: **EO Rank:** **EO Rank Date:**

Observed Area (acres): **Estimated Representation Accuracy:**

Comments:

General Description: GENTLE SLOPE, ERODING; WITH GRASSES AND CALLIANDRA

Comments: NO APPARENT USE BY DEER, CATTLE, OR SPANISH GOATS; ONE PLANT WITH LEAVES NEATLY CUT OFF AND LAYING BY PLANT, PERHAPS THE WORK OF ANTS, CATEPILLARS, OR BEETLES

Protection Comments:

Management Comments:

Data:

EO Data: 3 POPULATIONS CA. 1.5 MILES APART; 4 PLANTS IN ONE POPULATION ON ZAPATA-VINEGARROON COMPLEX SOILS; THE OTHER 2 POPULATIONS ON FELIPE-ZORRA SOILS; ONE POPULATION WITH 32 PLANTS INCLUDING A FEW YOUNG ONES; 66 PLANTS AT THIRD POPULATION WITH SOME YOUNG ONES, SOME GROWING IN THE SHADE OF A GUAJILLO; PRIMARILY IN FRUIT, A FEW STILL BLOOMING

Managed Area:

Managed Area Name: **Managed Area Type:**

Reference:

Element Occurrence Record

Full Citation:

POOLE, JACKIE M. NO DATE. TEXAS PARKS AND WILDLIFE DEPARTMENT, WILDLIFE DIVERSITY BRANCH, 4200 SMITH SCHOOL ROAD, AUSTIN, TEXAS 78744; 512/389-8019; jackie.poole@tpwd.state.tx.us

Specimen:

Associated Species:

Species Name	Type	Comments

Element Occurrence Record

Scientific Name:	*Lasiurus xanthinus*	**Occurrence #:**	4	**Eo Id:**	7586
Common Name:	Western Yellow Bat	**TX Protection Status:**		**ID Confirmed:**	Y
Global Rank:	G5	**State Rank:** S1		**Federal Status:**	

Location Information:

Watershed Code:	**Watershed Description:**
13080001	Elm-Sycamore

County Code:	**County Name:**	**Mapsheet Code:**	**Mapsheet Name:**	**State:**
TXVALV	Val Verde	29100-C8	Del Rio SW	TX
		29100-C7	Del Rio SE	TX
		29100-D8	Del Rio NW	TX

Directions:

WITHIN DEL RIO CITY LIMITS

Survey Information:

First Observation: 1998-06 **Survey Date:** **Last Observation:** 1998-06

Eo Type: **EO Rank:** **EO Rank Date:**

Observed Area (acres): **Estimated Representation Accuracy:**

Comments:

General Description: FOUND NEAR A CONDOMINIUM COMPLEX SWIMMING POOL LINED WITH PALM TREES

Comments:

Protection Comments:

Management Comments:

Data:

EO Data: JUNE 1998, FEMALE WITH BROKEN WING

Managed Area:

Managed Area Name: **Managed Area Type:**

Reference:

Element Occurrence Record

Full Citation:

WEYANDT, S.E., T.E. LEE, JR., AND J.C. PATTON. 2001. NOTEWORTHY RECORD OF THE WESTERN YELLOW BAT LASIURUS XANTHINUS (CHIROPTERA: VESPERTILIONIDAE) AND A REPORT ON THE BATS OF EAGLE NEST CANYON, VAL VERDE COUNTY, TEXAS. TEXAS JOURNAL OF SCIENCE 53(3):289-291.

Specimen:

ABILENE CHRISTIAN UNIVERSITY, NATURAL HISTORY COLLECTION. 1998. UNKNOWN COLLECTOR. CATALOG # 701 AF369546 ACUNHC. JUNE 1998.

Associated Species:

Species Name	Type	Comments

Element Occurrence Record

Scientific Name:	*Nesaea longipes*			**Occurrence #:**	1 . **Eo Id:** 6400
Common Name:	longstalk heimia			**TX Protection Status:**	**ID Confirmed:** Y
Global Rank:	G2G3	**State Rank:**	S2	**Federal Status:**	

Location Information:

Watershed Code:	**Watershed Description:**
13040212	Amistad Reservoir

County Code:	**County Name:**	**Mapsheet Code:**	**Mapsheet Name:**	**State:**
TXVALV	Val Verde	29100-C7	Del Rio SE	TX

Directions:

LAUGHLIN AIR FORCE BASE; FIVE LOCATIONS, MOSTLY ON FLOODPLAIN OF SACATOSA CREEK ON EASTERN EDGE OF BASE

Survey Information:

First Observation: 1997-06-12 **Survey Date:** 1997-09-10 **Last Observation:** 1997-09-10

Eo Type: **EO Rank:** **EO Rank Date:**

Observed Area (acres): **Estimated Representation Accuracy:**

Comments:

General Description: MOSTLY ON OCCASIONALLY INUNDATED TERRACES OF SACATOSA CREEK, MOSTLY IN OPEN UNSHADED AREAS

Comments: FOR DETAILS SEE RESEARCH IN MAF

Protection Comments:

Management Comments:

Data:

EO Data: SEVERAL THOUSAND PLANTS OBSERVED AT FIVE SITES DURING 1997 THRIVING AT SEVERAL LOCATIONS

Managed Area:

Managed Area Name:	**Managed Area Type:**
LAUGHLIN AIR FORCE BASE	FDFDD

Reference:

Full Citation:

Element Occurrence Record

Specimen:

UNIVERSITY OF TEXAS AT AUSTIN HERBARIUM. 1997. W.R. CARR #11603, 16603, 16605, 16995, SPECIMEN # NONE
TEX. 12 JUNE AND 10 SEPTEMBER 1997.

Associated Species:

Species Name	Type	Comments

Element Occurrence Record

Scientific Name: *Phrynosoma cornutum* **Occurrence #:** 1 **Eo Id:** 6029

Common Name: Texas Horned Lizard **TX Protection Status:** T **ID Confirmed:** Y

Global Rank: G4G5 **State Rank:** S4 **Federal Status:**

Location Information:

Watershed Code:	Watershed Description:
13040212	Amistad Reservoir

County Code:	County Name:	Mapsheet Code:	Mapsheet Name:	State:
TXVALV	Val Verde	29100-C7	Del Rio SE	TX

Directions:

NORTHEAST SECTOR OF LAUGHLIN AIR FORCE BASE; ON WEST EDGE OF DIRT ROAD; CA. 0.2 MILE WEST OF PICNIC AREA

Survey Information:

First Observation: **Survey Date:** 1993-05-12 **Last Observation:** 1993-05-12

Eo Type: **EO Rank:** **EO Rank Date:**

Observed Area (acres): **Estimated Representation Accuracy:**

Comments:

General Description:

Comments:

Protection Comments:

Management Comments:

Data:

EO Data: ONE JUVENILE

Managed Area:

Managed Area Name:	Managed Area Type:
LAUGHLIN AIR FORCE BASE	FDFDD

Reference:

Full Citation:

WHITING, MARTIN, ANDY PRICE, AND PAUL TURNER. 1993. FIELD SURVEY TO LAUGHLIN AIR FORCE BASE, SPOFFORD AUXILLARY AIRFIELD, AND LAKE AMISTAD RECREATION AREA OF 11-13 MAY 1993.

Element Occurrence Record

Specimen:

Associated Species:

Species Name	Type	Comments

Element Occurrence Record

Scientific Name: *Acleisanthes crassifolia* **Occurrence #:** 10 **Eo Id:** 5793

Common Name: Texas trumpets **TX Protection Status:** **ID Confirmed:** Y

Global Rank: G2 **State Rank:** S2 **Federal Status:**

Location Information:

Watershed Code:	Watershed Description:
13080001	Elm-Sycamore

County Code:	County Name:	Mapsheet Code:	Mapsheet Name:	State:
TXVALV	Val Verde	29100-C7	Del Rio SE	TX

Directions:

Laughlin Air Force Base; approximately 2.6 air miles ESE of junction of US route 90 and FM 2523 E of Del Rio.

Survey Information:

First Observation: **Survey Date:** 1997-05-05 **Last Observation:** 1997-05-05

Eo Type: **EO Rank:** **EO Rank Date:**

Observed Area (acres): **Estimated Representation Accuracy:**

Comments:

General Description: OPENING IN GUAJILLO-DOMINATED LOW SHRUBLAND ON GENTLE WEST-FACING SLOPE UNDERLAIN BY BUDA LIMESTONE AND/OR UVALDE GRAVEL

Comments:

Protection Comments:

Management Comments:

Data:

EO Data: SIX PLANTS, SOME WITH CLEISTOGAMOUS FLOWERS AND IMMATURE FRUIT ON 5 MAY 1997; STEMS GONE (FOR SEASON) ON 10 SEPTEMBER 1997

Managed Area:

Managed Area Name:	Managed Area Type:
LAUGHLIN AIR FORCE BASE	FDFDD

Reference:

Full Citation:

CARR, W.R. 1997. NOTES ON THE VEGETATION AND FLORA OF LAUGHLIN AFB, VAL VERDE COUNTY, TEXAS.

Element Occurrence Record

Specimen:

UNIVERSITY OF TEXAS HERBARIUM. 1997. W.R. CARR #16244 (TEX-LL).

Associated Species:

Species Name	Type	Comments

Element Occurrence Record

Scientific Name: *Icterus cucullatus cucullatus* **Occurrence #:** 1 **Eo Id:** 3780

Common Name: Mexican Hooded Oriole **TX Protection Status:** **ID Confirmed:** Y

Global Rank: G5TU **State Rank:** S4B **Federal Status:**

Location Information:

Watershed Code:	Watershed Description:
13080001	Elm-Sycamore

County Code:	County Name:	Mapsheet Code:	Mapsheet Name:	State:
TXVALV	Val Verde	29100-C7	Del Rio SE	TX

Directions:

THE EAST PERIMETER JUST NORTH OF SOUTHEAST RUNWAY TERMINUS AND NORTHWEST OF THE CONFLUENCE OF SACATOSA CREEK AND AN UNNAMED NORTHWEST TRENDING TRIBUTARY ON LAUGHLIN AIR FORCE BASE; CA. 4.5 AIR MILES NORTH OF SACATOSA CREEK CROSSING AT HIGHWAY 277

Survey Information:

First Observation: **Survey Date:** 1993-05-12 **Last Observation:** 1993-05-12

Eo Type: **EO Rank:** B - Good estimated viability **EO Rank Date:** 1993-05-12

Observed Area (acres): **Estimated Representation Accuracy:**

Comments:

General Description: FOUND IN MESQUITE-HUISACHE, MESQUITE-GRANJENO BRUSHLAND IN SACATOSA CREEK FLOODPLAIN; SEVERAL PATCHES OF BRUSH NEAR SMALL PONDS AND STREAMS PROVIDE HABITAT FOR THIS CATEGORY 2 SUBSPECIES AT AND ADJACENT TO LAUGHLIN AFB

Comments: ANY HABITAT ON AN AFB COULD BE DOZED AT ANY TIME AT THE DISCRETION OR WHIM OF THE CO; MOST LIKELY ICTERUS CUCULLATUS CUCULLATUS, BUT ICTERUS CUCULLATUS SENNETTI CANNOT BE RULED OUT BECAUSE OF RANGE OVERLAP

Protection Comments:

Management Comments:

Data:

EO Data: BREEDING BIRDS AS INDICATED BY SINGING MALE; ONE SINGING MALE OBSERVED ON 21 MAY 1993

Managed Area:

Managed Area Name:	Managed Area Type:
LAUGHLIN AIR FORCE BASE	FDFDD

Reference:

Element Occurrence Record

Full Citation:

TURNER, PAUL D. 1993. BIOLOGICAL INVENTORY FOR LAUGHLIN AIR FORCE BASE AND FIELD NOTES OF 11-13 MAY 1993.

Specimen:

Associated Species:

Species Name	Type	Comments

Element Occurrence Record

Scientific Name:	*Ursus americanus*			**Occurrence #:**	10	**Eo Id:**	2253
Common Name:	Black Bear			**TX Protection Status:**	T	**ID Confirmed:**	Y
Global Rank:	G5	**State Rank:**	S3	**Federal Status:**	SAT		

Location Information:

Watershed Code:	**Watershed Description:**
13040212	Amistad Reservoir

County Code:	**County Name:**
TXVALV	Val Verde
TXKINN	Kinney

Mapsheet Code:	**Mapsheet Name:**	**State:**
29100-C7	Del Rio SE	TX
29100-C6	Mud Creek South	TX
29100-B6	Cow Creek Tank	TX
29100-B7	Maverick Dam	TX

Directions:

CA. 12 MILES SOUTHEAST OF DEL RIO

Survey Information:

First Observation: **Survey Date:** **Last Observation:** 1988-06

Eo Type: **EO Rank:** **EO Rank Date:**

Observed Area (acres): **Estimated Representation Accuracy:**

Comments:

General Description:

Comments: VALID, BUT UNVERIFIED DUE TO THE LACK OF TANGIBLE EVIDENCE; INVESTIGATOR BELIEVED BEAR WAS OBSERVED

Protection Comments:

Management Comments:

Data:

EO Data: ONE ADULT BLACK BEAR, 125 LB

Managed Area:

Managed Area Name: **Managed Area Type:**

Element Occurrence Record

Reference:

Full Citation:

FLEMING, KAY M. 1989. FINAL REPORT, NONGAME WILDLIFE INVESTIGATIONS, FEDERAL AID PROJECT NO. W-103-R-19, JOB NO. 68: BLACK BEAR STATUS. TPWD. OCTOBER 27, 1989.

Specimen:

Associated Species:

Species Name	Type	Comments

Element Occurrence Record

Scientific Name:	*Icterus cucullatus cucullatus*	**Occurrence #:**	2	**Eo Id:**	2346
Common Name:	Mexican Hooded Oriole	**TX Protection Status:**		**ID Confirmed:**	Y
Global Rank:	G5TU	**State Rank:**	S4B	**Federal Status:**	

Location Information:

Watershed Code:	**Watershed Description:**
13080001	Elm-Sycamore

County Code:	**County Name:**	**Mapsheet Code:**	**Mapsheet Name:**	**State:**
TXVALV	Val Verde	29100-C7	Del Rio SE	TX

Directions:

THE PERIMETER ROAD IN NORTHWEST CORNER OF LAUGHLIN AIR FORCE BASE IN THE ZORRO CREEK DRAINAGE; CA. 2.8 AIR MILES WEST-SOUTHWEST OF PICNIC AREA; CA. 2.6 AIR MILES NORTH-NORTHEAST OF HIGHWAY 277 AND SPUR 317 INTERSECTION

Survey Information:

First Observation:

Survey Date: 1993-05-12

Last Observation: 1993-05-12

Eo Type:

EO Rank: B - Good estimated viability

EO Rank Date: 1993-05-12

Observed Area (acres):

Estimated Representation Accuracy:

Comments:

General Description: BRUSH PATCH IN ZORRO CREEK DRAINAGE; IN MESQUITE-GRANJENO OR MESQUITE-HUISACHE; ONE OF SEVERAL PATCHES OF BRUSH NEAR SMALL PONDS OR DRAINAGES LOCATED ON OR ADJACENT TO LAUGHLIN AFB

Comments: ANY HABITAT ON LAUGHLIN AFB IS SUBJECT TO POSSIBLE DISTURBANCE; MOST LIKELY ICTERUS CUCULLATUS CUCULLATUS, BUT ICTERUS CUCULLATUS SENNETTI CANNOT BE RULED OUT BECAUSE OF RANGE OVERLAP

Protection Comments:

Management Comments:

Data:

EO Data: ONE SINGING MALE, INDICATING PROBABLE BREEDING PAIR, SEEN ON 12 MAY 1993

Managed Area:

Managed Area Name:	**Managed Area Type:**
LAUGHLIN AIR FORCE BASE	FDFDD

Reference:

Element Occurrence Record

Full Citation:

TURNER, PAUL D. 1993. BIOLOGICAL INVENTORY FOR LAUGHLIN AIR FORCE BASE AND FIELD NOTES OF 11-13 MAY 1993.

Specimen:

Associated Species:

Species Name	Type	Comments

PUBLIC NOTICE

Notice of Public Comment on Draft Environmental Assessment
Construction of a Photovoltaic Solar Array, Laughlin Air Force Base

Laughlin Air Force Base invites public comment on the Draft Environmental Assessment (EA) to construct and operate a Photovoltaic (PV) solar array at Laughlin Air Force Base, Del Rio, Texas, in response to Executive Order 13423, Executive Order 13514, and the Energy Policy Act of 2005. The PV solar array would be located within an 85 acre, undeveloped area, in the western portion of Laughlin Air Force Base and would be capable of generating up to 10-megawatts of electricity. The Draft EA was composed to evaluate the environmental impacts this action and alternatives pursuant to the requirements of the National Environmental Policy Act (NEPA) of 1969, the implementing procedures at 39 CFR 775 and the President's Council on Environmental Quality Regulations (40 CFR parts 1500-1508). Two alternatives were identified, an alternate site alternative and a "no action" alternative. The EA evaluated air quality, climate, biological resources, cultural resources, geology and soils, hazardous materials/hazardous waste/solid waste, land use, noise, socioeconomics, environmental justice and the protection of children, utilities/infrastructure, and water resources. Based on the results of the EA, the United States Air Force has issued a FONSI indicating that the preferred alternative will not have a significant impact on the environment.

Copies of the EA are located at the Val Verde County Library, 300 Spring Street, Del Rio, Texas; and Bookmark Library, Building 257, Laughlin Air Force Base, Texas. Comments may be submitted through September 7, 2011 and should be provided to Mr. Gene Moore, Environmental Flight Chief, 47 CES/CEAN, 251 Fourth Street, Building 100, Laughlin AFB, Texas 78843; or please call 830-298-5960, 830-298-5063, or 830-298-5029.

PRIVACY ADVISORY NOTICE

Your comments on this Draft EA are requested. Any submitted letters or other written comments may be published in the Final EA. As required by law, comments will be addressed in the Final EA and made available to the public. Any personal information provided will be used only to indentify your intent to make a statement during the public comment period or to fulfill requests for copies of the Final EA. Addresses will be compiled to create a mailing; however, such personal information will be kept confidential unless release is required by law.

PUBLIC SAFETY AND HOMELAND SECURITY BUREAU ANNOUNCES REGION 53 (TEXAS-SAN ANTONIO) 700 MHZ REGIONAL PLANNING COMMITTEE INITIAL MEETING

The Region 53 (Texas-San Antonio)1 700 MHz Public Safety Regional Planning Committee (RPC) Convener announces that the initial meeting of the Region 53 700 MHz Public Safety RPC will be held on Thursday, August 11, 2011 at 1:30 p.m., at the Holiday Inn Express, 6502 Padre Island Boulevard, South Padre Island, Texas. The purpose of the meeting is to organize the committee, select a Chairman and other officers, and establish subcommittees to plan for the future use of radio frequencies in the 700 MHz band.

The Region 53 700 MHz Public Safety RPC meeting is open to the public. All eligible public safety providers in Region 53 may utilize these frequencies. It is essential that eligible public safety agencies in all areas of government, including state, municipality, county, and Native American Tribal, and non-governmental organizations eligible under Section 90.523 of the Commission's rules, 47 C.F.R. § 90.523, be represented in order to ensure that each agency's future spectrum needs are considered in the allocation process. Administrators who are not oriented in the communications field should delegate someone with this knowledge to attend, participate, and represent their agency's needs.

All interested parties wishing to participate in planning for the use of public safety spectrum in the 700 MHz band within Region 53 should plan to attend. For further information, please contact:

Richard Morales, Jr., Convener
Region 53 700 MHz RPC
Information Technology Manager
Radio Services Communications Division (ITSD)
City of San Antonio, Texas
(210) 207-7022
Richard.morales@sanantonio.gov

-FCC-

1 The Region 53 (Texas-San Antonio) 700 MHz regional planning area consists of the counties of Aransas, Atascosa, Bandera, Bee, Bexar, Brooks, Calhoun, Cameron, Comal, Dewitt, Dimmit, Duval, Edwards, Frio, Gillespie, Goliad, Gonzales, Guadalupe, Hidalgo, Jackson, Jim Hogg, Jim Wells, Karnes, Kenedy, Kerr, Kendall, Kinney, Kleberg, LaSalle, Lavaca, Live Oak, Maverick, McMullen, Medina, Nueces, Real, Refugio, San Patricio, Starr, Uvalde, Val Verde, Victoria, Webb, Willacy, Wilson, Zapata, and Zavala.

Notice of Request for Proposals

The City of Del Rio will be accepting Competitive Sealed Proposals for the New Emergency Operations Center (EOC) Project. The deadline to submit the proposals will be at 2:00 PM on August 29th, 2011, at which time the proposals will be publicly opened and read aloud. Sealed Proposal submittals should be addressed to the attention of Susan Corp, City Secretary, 109 West Broadway Street, Del Rio, Texas 78840 and must be clearly labeled and identified as,

"Request for Competitive Sealed Proposals", "New Emergency Operations Center".

The project will consist of constructing a new 3,265 SF building adjacent to Fire Station No. 4 / 911 Call Center building located at 1051 W. 10th Street, Del Rio, Texas. The building shall house a watch floor, large and small conference spaces, work space for EOC staff, employee restroom, break area, and support spaces. The project will also require providing some basic utility infrastructure connections and creating a mechanical yard.

The Proposers must submit a bid bond, cashier's check, or certified check for not less than five percent (5%) of the proposed construction cost. Performance and Payment Bonds are required when the successful offerer executes this contract, each for 100% of the total contract price. This is a lump sum proposal.

Proposal documents and Plans may be obtained from the Architect's office at Naismith Engineering, Inc. located at 4501 Gollihar Road, Corpus Christi, Texas 78411. For additional information from the Architect, please call 361-814-9900. Proposal packages will also be available at the City Engineer's Office at 114 W. Martin Street, Del Rio, Texas 78840. For additional information from the City Engineer, please call 830-774-8525. To attain a set of the proposal package a non-refundable fee of $100.00 dollars is required. If Proposers wish to request a set of the proposal package to be mailed to their offices, they must provide their company's FedEx shipping account number.

Susan Corp
City Secretary
City of Del Rio

280 Help Wanted Full Time | 280 Help Wanted Full Time | 290 Lease / Rent

APPENDIX C – ENERGY DATA

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Appendix C
Potential Megawatts Based on Available Sunshine at Laughlin AFB

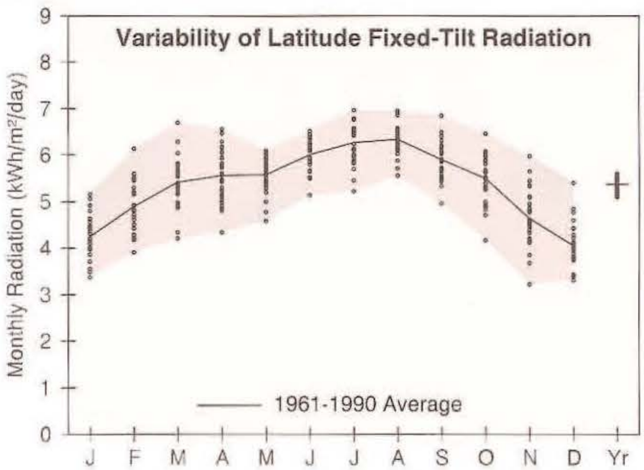
Month	Days	Length of Day Month Low[3]	Length of Day Month High[3]	Average Available Sunlight (hours/ minutes)	Percent sunshine[2]	Convert minutes to percent[1]	Average available sunlight	Monthly Total Hours of Available Sunshine (days X average available sunlight)	Size of PV Array	Megawatts per Month	2009/2010 Usage in MW for Base Only	Difference
January	31	10:18	10:47	10:32	0.7	0.533333333	10.53333333	326.53	10.00	3,265.33	2,627	638
February	28	10:48	11:32	10:40	0.7	0.666666667	10.66666667	298.67	10.00	2,986.67	2,599	388
March	31	11:33	12:27	12:00	0.7	1	12	372.00	10.00	3,720.00	2,849	871
April	30	12:29	13:17	12:48	0.7	0.8	12.8	384.00	10.00	3,840.00	3,342	498
May	31	13:18	13:54	13:36	0.7	0.6	13.6	421.60	10.00	4,216.00	3,823	393
June	30	13:55	14:02	13:59	0.7	0.983333333	14.98333333	449.50	10.00	4,495.00	4,140	355
July	31	13:33	14:00	13:47	0.7	0.783333333	14.78333333	458.28	10.00	4,582.83	4,454	129
August	31	12:46	13:32	13:09	0.7	0.15	13.15	407.65	10.00	4,076.50	4,458	**-382**
September	30	11:54	12:44	12:19	0.7	0.316666667	12.31666667	369.50	10.00	3,695.00	3,720	**-25**
October	31	11:02	11:52	11:27	0.7	0.45	11.45	354.95	10.00	3,549.50	3,106	444
November	30	10:24	11:00	10:42	0.7	0.7	10.7	321.00	10.00	3,210.00	3,013	197
December	31	10:17	10:24	10:21	0.7	0.35	9.35	289.85	10.00	2,898.50	2,862	36
Total	**365**							**4,453.53**		**44,535.33**	**40,993**	**3,542**

Notes:

1 - Convert minutes from percent minutes/60 (i.e. 52/60 = 0.866667)

2 - National Oceanic Atmospheric Administration data shows that average cloud cover is 30 percent over the typical month; consequently the percent of sunshine was calculated at 70 percent.

3 - Source: timeand date.com 2010



San Antonio, TX

WBAN NO. 12921

LATITUDE: 29.53° N
LONGITUDE: 98.47° W
ELEVATION: 242 meters
MEAN PRESSURE: 988 millibars

STATION TYPE: Primary

Solar Radiation for Flat-Plate Collectors Facing South at a Fixed Tilt (kWh/m²/day), Uncertainty ±9%

Tilt (°)		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
0	Average	3.1	3.9	4.8	5.5	6.0	6.7	6.9	6.4	5.4	4.5	3.4	2.9	4.9
	Min/Max	2.6/3.5	3.3/4.6	3.8/5.8	4.3/6.4	4.9/6.5	5.7/7.3	5.6/7.7	5.6/7.1	4.7/6.2	3.6/5.1	2.7/4.1	2.5/3.5	4.7/5.2
Latitude -15	Average	3.7	4.5	5.2	5.7	5.9	6.5	6.7	6.6	5.8	5.1	4.1	3.5	5.3
	Min/Max	3.0/4.5	3.7/5.5	4.1/6.4	4.4/6.7	4.9/6.4	5.5/7.1	5.6/7.5	5.7/7.2	4.9/6.7	4.0/5.9	3.0/5.2	3.0/4.6	5.0/5.5
Latitude	Average	4.3	4.9	5.4	5.6	5.6	6.0	6.3	6.3	5.9	5.5	4.6	4.1	5.4
	Min/Max	3.4/5.2	3.9/6.1	4.2/6.7	4.3/6.6	4.6/6.1	5.1/6.5	5.2/7.0	5.6/6.9	5.0/6.8	4.2/6.5	3.2/6.0	3.3/5.4	5.1/5.6
Latitude +15	Average	4.5	5.0	5.3	5.2	5.0	5.2	5.5	5.8	5.7	5.6	4.9	4.4	5.2
	Min/Max	3.5/5.6	4.0/6.4	4.1/6.6	4.0/6.1	4.1/5.4	4.5/5.6	4.6/6.1	5.1/6.3	4.8/6.6	4.2/6.6	3.3/6.4	3.5/5.9	4.9/5.4
90	Average	3.8	3.8	3.4	2.7	2.1	1.9	2.0	2.6	3.3	4.0	4.0	3.8	3.1
	Min/Max	2.9/4.8	2.9/5.0	2.7/4.2	2.2/3.0	1.9/2.2	1.8/2.0	1.9/2.1	2.4/2.7	2.8/3.8	2.9/4.8	2.5/5.4	2.9/5.3	2.9/3.3

Solar Radiation for 1-Axis Tracking Flat-Plate Collectors with a North-South Axis (kWh/m²/day), Uncertainty ±9%

Axis Tilt (°)		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
0	Average	4.2	5.2	6.3	6.9	7.3	8.4	8.7	8.3	7.1	6.1	4.7	3.9	6.4
	Min/Max	3.3/5.1	4.1/6.6	4.6/8.0	4.9/8.6	5.6/8.2	6.6/9.5	6.6/10.2	6.9/9.5	5.7/8.6	4.4/7.4	3.2/6.1	3.2/5.3	6.0/6.8
Latitude -15	Average	4.7	5.7	6.6	7.1	7.3	8.3	8.7	8.4	7.4	6.6	5.2	4.4	6.7
	Min/Max	3.6/5.8	4.4/7.3	4.9/8.5	5.0/8.8	5.6/8.2	6.5/9.4	6.6/10.1	7.0/9.6	5.9/9.0	4.7/8.0	3.5/6.9	3.5/6.0	6.2/7.1
Latitude	Average	5.1	6.0	6.8	7.0	7.1	7.9	8.4	8.3	7.5	6.9	5.6	4.8	6.8
	Min/Max	3.9/6.3	4.6/7.7	5.0/8.8	4.9/8.7	5.4/8.0	6.2/9.0	6.3/9.7	6.9/9.5	5.9/9.1	4.8/8.4	3.6/7.5	3.8/6.7	6.3/7.2
Latitude +15	Average	5.3	6.1	6.7	6.7	6.7	7.4	7.8	7.9	7.3	6.9	5.8	5.0	6.6
	Min/Max	4.0/6.7	4.6/7.9	4.9/8.7	4.7/8.4	5.0/7.5	5.8/8.4	5.9/9.1	6.6/9.0	5.8/8.9	4.8/8.5	3.7/7.8	4.0/7.1	6.2/7.0

Solar Radiation for 2-Axis Tracking Flat-Plate Collectors (kWh/m²/day), Uncertainty ±9%

Tracker		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
2-Axis	Average	5.3	6.1	6.8	7.1	7.4	8.4	8.8	8.4	7.5	6.9	5.8	5.1	7.0
	Min/Max	4.0/6.7	4.7/7.9	5.0/8.8	5.0/8.8	5.6/8.3	6.6/9.6	6.7/10.3	7.1/9.7	5.9/9.1	4.9/8.5	3.7/7.9	4.0/7.2	6.5/7.4

Direct Beam Solar Radiation for Concentrating Collectors (kWh/m²/day), Uncertainty ±8%

Tracker		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
1-Axis, E-W	Average	3.0	3.3	3.3	3.2	3.3	4.0	4.4	4.1	3.6	3.7	3.3	3.0	3.5
Horiz Axis	Min/Max	2.0/4.2	2.2/4.8	1.9/5.0	1.5/4.5	1.6/4.1	2.5/5.1	2.6/5.8	2.9/5.2	2.2/5.1	2.0/5.0	1.5/5.1	2.1/4.7	3.1/3.9
1-Axis, N-S	Average	2.7	3.4	4.0	4.2	4.2	5.2	5.7	5.4	4.5	4.1	3.1	2.5	4.1
Horiz Axis	Min/Max	1.7/3.8	2.3/5.0	2.3/6.1	1.9/6.0	2.1/5.3	3.1/6.7	3.3/7.6	3.8/6.8	2.8/6.4	2.2/5.7	1.5/4.8	1.7/4.0	3.6/4.6
1-Axis, N-S	Average	3.4	4.1	4.4	4.2	4.1	4.8	5.3	5.3	4.8	4.7	3.9	3.2	4.4
Tilt=Latitude	Min/Max	2.2/4.8	2.7/5.9	2.6/6.7	1.9/6.1	2.0/5.1	2.9/6.2	3.1/7.1	3.8/6.7	3.0/6.9	2.5/6.5	1.8/6.0	2.3/5.2	3.8/4.9
2-Axis	Average	3.7	4.2	4.4	4.3	4.3	5.3	5.7	5.5	4.8	4.8	4.1	3.5	4.5
	Min/Max	2.3/5.1	2.8/6.1	2.6/6.7	1.9/6.2	2.2/5.4	3.2/6.7	3.3/7.7	3.9/6.9	3.0/6.9	2.6/6.6	1.9/6.3	2.4/5.7	4.0/5.1

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°C)	9.6	11.9	16.5	20.7	24.2	27.9	29.4	29.4	26.3	21.2	15.8	11.2	20.3
Daily Minimum Temp	3.3	5.2	9.8	14.7	18.7	22.6	23.9	23.6	20.7	14.9	9.3	4.9	14.3
Daily Maximum Temp	16.0	18.7	23.1	26.8	29.6	33.2	35.0	35.2	31.8	27.6	22.2	17.5	26.4
Record Minimum Temp	-17.8	-14.4	-7.2	-0.6	6.1	11.7	16.7	16.1	5.0	0.6	-6.1	-14.4	-17.8
Record Maximum Temp	31.7	36.1	37.8	37.8	39.4	40.6	41.1	42.2	39.4	37.2	34.4	32.2	42.2
HDD, Base 18.3°C	274	184	93	18	0	0	0	0	0	17	100	227	913
CDD, Base 18.3°C	4	6	36	89	181	287	344	343	238	106	23	7	1664
Relative Humidity (%)	67	65	63	66	71	69	65	65	68	67	68	68	67
Wind Speed (m/s)	3.9	4.2	4.5	4.4	4.4	4.3	4.2	3.8	3.8	3.8	3.8	3.8	4.1

Sunrise Sunset Times for San ANtonio, Texas in January 2010

Rising and setting times for the Sun

Date	Sunrise	Sunset	Length of day: This day	Length of day: Difference	Solar noon: Time	Solar noon: Altitude	Distance (10^6 km)
1-Jan-10	7:29 AM	5:47 PM	10h 18m 08s	+ 26s	12:38 PM	37.6°	147.095
2-Jan-10	7:29 AM	5:47 PM	10h 18m 37s	+ 28s	12:38 PM	37.7°	147.094
3-Jan-10	7:29 AM	5:48 PM	10h 19m 08s	+ 31s	12:39 PM	37.8°	147.094
4-Jan-10	7:29 AM	5:49 PM	10h 19m 41s	+ 33s	12:39 PM	37.9°	147.096
5-Jan-10	7:29 AM	5:50 PM	10h 20m 17s	+ 35s	12:39 PM	38.0°	147.098
6-Jan-10	7:30 AM	5:50 PM	10h 20m 56s	+ 38s	12:40 PM	38.2°	147.101
7-Jan-10	7:30 AM	5:51 PM	10h 21m 36s	+ 40s	12:40 PM	38.3°	147.104
8-Jan-10	7:30 AM	5:52 PM	10h 22m 19s	+ 42s	12:41 PM	38.4°	147.109
9-Jan-10	7:30 AM	5:53 PM	10h 23m 04s	+ 44s	12:41 PM	38.6°	147.114
10-Jan-10	7:30 AM	5:54 PM	10h 23m 51s	+ 47s	12:42 PM	38.7°	147.12
11-Jan-10	7:30 AM	5:54 PM	10h 24m 40s	+ 49s	12:42 PM	38.9°	147.126
12-Jan-10	7:30 AM	5:55 PM	10h 25m 32s	+ 51s	12:42 PM	39.0°	147.133
13-Jan-10	7:30 AM	5:56 PM	10h 26m 25s	+ 53s	12:43 PM	39.2°	147.141
14-Jan-10	7:30 AM	5:57 PM	10h 27m 21s	+ 55s	12:43 PM	39.4°	147.149
15-Jan-10	7:29 AM	5:58 PM	10h 28m 18s	+ 57s	12:43 PM	39.6°	147.158
16-Jan-10	7:29 AM	5:59 PM	10h 29m 17s	+ 59s	12:44 PM	39.8°	147.167
17-Jan-10	7:29 AM	5:59 PM	10h 30m 19s	+ 1m 01s	12:44 PM	40.0°	147.177
18-Jan-10	7:29 AM	6:00 PM	10h 31m 22s	+ 1m 03s	12:44 PM	40.2°	147.188
19-Jan-10	7:29 AM	6:01 PM	10h 32m 27s	+ 1m 04s	12:45 PM	40.4°	147.199
20-Jan-10	7:28 AM	6:02 PM	10h 33m 33s	+ 1m 06s	12:45 PM	40.6°	147.21
21-Jan-10	7:28 AM	6:03 PM	10h 34m 42s	+ 1m 08s	12:45 PM	40.8°	147.223
22-Jan-10	7:28 AM	6:04 PM	10h 35m 52s	+ 1m 09s	12:46 PM	41.0°	147.236
23-Jan-10	7:28 AM	6:05 PM	10h 37m 03s	+ 1m 11s	12:46 PM	41.3°	147.249
24-Jan-10	7:27 AM	6:05 PM	10h 38m 16s	+ 1m 13s	12:46 PM	41.5°	147.264
25-Jan-10	7:27 AM	6:06 PM	10h 39m 31s	+ 1m 14s	12:46 PM	41.8°	147.279
26-Jan-10	7:26 AM	6:07 PM	10h 40m 47s	+ 1m 16s	12:47 PM	42.0°	147.295
27-Jan-10	7:26 AM	6:08 PM	10h 42m 05s	+ 1m 17s	12:47 PM	42.3°	147.312
28-Jan-10	7:25 AM	6:09 PM	10h 43m 24s	+ 1m 19s	12:47 PM	42.5°	147.33
29-Jan-10	7:25 AM	6:10 PM	10h 44m 44s	+ 1m 20s	12:47 PM	42.8°	147.348
30-Jan-10	7:24 AM	6:11 PM	10h 46m 06s	+ 1m 21s	12:47 PM	43.1°	147.368
31-Jan-10	7:24 AM	6:11 PM	10h 47m 29s	+ 1m 22s	12:47 PM	43.3°	147.388

Sunrise Sunset Times for San ANtonio, Texas in February 2010

Rising and setting times for the Sun

Date	Sunrise	Sunset	Length of day: This day	Length of day: Difference	Solar noon: Time	Solar noon: Altitude	Distance (10^6 km)
1-Feb-10	7:23 AM	6:12 PM	10h 48m 53s	+ 1m 24s	12:48 PM	43.6°	147.41
2-Feb-10	7:23 AM	6:13 PM	10h 50m 18s	+ 1m 25s	12:48 PM	43.9°	147.432
3-Feb-10	7:22 AM	6:14 PM	10h 51m 45s	+ 1m 26s	12:48 PM	44.2°	147.455
4-Feb-10	7:21 AM	6:15 PM	10h 53m 12s	+ 1m 27s	12:48 PM	44.5°	147.478
5-Feb-10	7:21 AM	6:16 PM	10h 54m 41s	+ 1m 28s	12:48 PM	44.8°	147.503
6-Feb-10	7:20 AM	6:16 PM	10h 56m 11s	+ 1m 29s	12:48 PM	45.1°	147.528
7-Feb-10	7:19 AM	6:17 PM	10h 57m 41s	+ 1m 30s	12:48 PM	45.4°	147.553
8-Feb-10	7:19 AM	6:18 PM	10h 59m 13s	+ 1m 31s	12:48 PM	45.8°	147.58
9-Feb-10	7:18 AM	6:19 PM	11h 00m 46s	+ 1m 32s	12:48 PM	46.1°	147.606
10-Feb-10	7:17 AM	6:20 PM	11h 02m 19s	+ 1m 33s	12:48 PM	46.4°	147.634
11-Feb-10	7:16 AM	6:20 PM	11h 03m 53s	+ 1m 34s	12:48 PM	46.7°	147.661
12-Feb-10	7:16 AM	6:21 PM	11h 05m 28s	+ 1m 35s	12:48 PM	47.1°	147.689
13-Feb-10	7:15 AM	6:22 PM	11h 07m 04s	+ 1m 35s	12:48 PM	47.4°	147.718
14-Feb-10	7:14 AM	6:23 PM	11h 08m 41s	+ 1m 36s	12:48 PM	47.7°	147.747
15-Feb-10	7:13 AM	6:23 PM	11h 10m 18s	+ 1m 37s	12:48 PM	48.1°	147.776
16-Feb-10	7:12 AM	6:24 PM	11h 11m 56s	+ 1m 37s	12:48 PM	48.4°	147.805
17-Feb-10	7:11 AM	6:25 PM	11h 13m 35s	+ 1m 38s	12:48 PM	48.8°	147.835
18-Feb-10	7:10 AM	6:26 PM	11h 15m 14s	+ 1m 39s	12:48 PM	49.1°	147.865
19-Feb-10	7:10 AM	6:26 PM	11h 16m 54s	+ 1m 39s	12:48 PM	49.5°	147.896
20-Feb-10	7:09 AM	6:27 PM	11h 18m 34s	+ 1m 40s	12:48 PM	49.8°	147.927
21-Feb-10	7:08 AM	6:28 PM	11h 20m 15s	+ 1m 40s	12:48 PM	50.2°	147.959
22-Feb-10	7:07 AM	6:29 PM	11h 21m 56s	+ 1m 41s	12:47 PM	50.6°	147.991
23-Feb-10	7:06 AM	6:29 PM	11h 23m 38s	+ 1m 41s	12:47 PM	50.9°	148.023
24-Feb-10	7:05 AM	6:30 PM	11h 25m 20s	+ 1m 42s	12:47 PM	51.3°	148.057
25-Feb-10	7:04 AM	6:31 PM	11h 27m 03s	+ 1m 42s	12:47 PM	51.7°	148.09
26-Feb-10	7:03 AM	6:31 PM	11h 28m 46s	+ 1m 43s	12:47 PM	52.0°	148.125
27-Feb-10	7:02 AM	6:32 PM	11h 30m 29s	+ 1m 43s	12:47 PM	52.4°	148.16
28-Feb-10	7:01 AM	6:33 PM	11h 32m 13s	+ 1m 43s	12:46 PM	52.8°	148.195

Rising and setting times for the Sun

Date	Sunrise	Sunset	Length of day		Solar noon		
			This day	Difference	Time	Altitude	Distance (10^6 km)
1-Mar-10	7:00 AM	6:33 PM	11h 33m 57s	+ 1m 44s	12:46 PM	53.2°	148.232
2-Mar-10	6:58 AM	6:34 PM	11h 35m 42s	+ 1m 44s	12:46 PM	53.6°	148.269
3-Mar-10	6:57 AM	6:35 PM	11h 37m 26s	+ 1m 44s	12:46 PM	53.9°	148.306
4-Mar-10	6:56 AM	6:35 PM	11h 39m 11s	+ 1m 44s	12:46 PM	54.3°	148.344
5-Mar-10	6:55 AM	6:36 PM	11h 40m 57s	+ 1m 45s	12:45 PM	54.7°	148.383
6-Mar-10	6:54 AM	6:37 PM	11h 42m 42s	+ 1m 45s	12:45 PM	55.1°	148.422
7-Mar-10	6:53 AM	6:37 PM	11h 44m 28s	+ 1m 45s	12:45 PM	55.5°	148.461
8-Mar-10	6:52 AM	6:38 PM	11h 46m 14s	+ 1m 45s	12:45 PM	55.9°	148.501
9-Mar-10	6:51 AM	6:39 PM	11h 48m 00s	+ 1m 46s	12:44 PM	56.3°	148.541
10-Mar-10	6:50 AM	6:39 PM	11h 49m 46s	+ 1m 46s	12:44 PM	56.7°	148.581
11-Mar-10	6:48 AM	6:40 PM	11h 51m 32s	+ 1m 46s	12:44 PM	57.1°	148.621
12-Mar-10	6:47 AM	6:41 PM	11h 53m 19s	+ 1m 46s	12:44 PM	57.5°	148.662
13-Mar-10	6:46 AM	6:41 PM	11h 55m 06s	+ 1m 46s	12:43 PM	57.8°	148.702
Note: hours shift because clocks change forward 1 hour (See below table for details)							
14-Mar-10	7:45 AM	7:42 PM	11h 56m 52s	+ 1m 46s	1:43 PM	58.2°	148.743
15-Mar-10	7:44 AM	7:42 PM	11h 58m 39s	+ 1m 46s	1:43 PM	58.6°	148.784
16-Mar-10	7:43 AM	7:43 PM	12h 00m 26s	+ 1m 46s	1:43 PM	59.0°	148.825
17-Mar-10	7:41 AM	7:44 PM	12h 02m 13s	+ 1m 46s	1:42 PM	59.4°	148.865
18-Mar-10	7:40 AM	7:44 PM	12h 04m 00s	+ 1m 46s	1:42 PM	59.8°	148.906
19-Mar-10	7:39 AM	7:45 PM	12h 05m 47s	+ 1m 46s	1:42 PM	60.2°	148.947
20-Mar-10	7:38 AM	7:45 PM	12h 07m 34s	+ 1m 46s	1:41 PM	60.6°	148.988
21-Mar-10	7:37 AM	7:46 PM	12h 09m 20s	+ 1m 46s	1:41 PM	61.0°	149.029
22-Mar-10	7:35 AM	7:47 PM	12h 11m 07s	+ 1m 46s	1:41 PM	61.4°	149.07
23-Mar-10	7:34 AM	7:47 PM	12h 12m 54s	+ 1m 46s	1:41 PM	61.8°	149.111
24-Mar-10	7:33 AM	7:48 PM	12h 14m 41s	+ 1m 46s	1:40 PM	62.2°	149.153
25-Mar-10	7:32 AM	7:48 PM	12h 16m 27s	+ 1m 46s	1:40 PM	62.6°	149.194
26-Mar-10	7:31 AM	7:49 PM	12h 18m 14s	+ 1m 46s	1:40 PM	63.0°	149.236
27-Mar-10	7:30 AM	7:50 PM	12h 20m 00s	+ 1m 46s	1:39 PM	63.4°	149.278
28-Mar-10	7:28 AM	7:50 PM	12h 21m 46s	+ 1m 46s	1:39 PM	63.8°	149.32
29-Mar-10	7:27 AM	7:51 PM	12h 23m 32s	+ 1m 46s	1:39 PM	64.1°	149.363
30-Mar-10	7:26 AM	7:51 PM	12h 25m 18s	+ 1m 45s	1:38 PM	64.5°	149.406
31-Mar-10	7:25 AM	7:52 PM	12h 27m 04s	+ 1m 45s	1:38 PM	64.9°	149.449

All times are in local time for San Antonio

Note that Daylight Saving Time started on Sunday, March 14, 2010 at 2:00 AM and this is accounted for above.

Sunrise Sunset Times for San ANtonio, Texas in April 2010

Rising and setting times for the Sun

Date	Sunrise	Sunset	Length of day: This day	Length of day: Difference	Solar noon: Time	Solar noon: Altitude	Distance (10^6 km)
1-Apr-10	7:24 AM	7:52 PM	12h 28m 50s	+ 1m 45s	1:38 PM	65.3°	149.492
2-Apr-10	7:22 AM	7:53 PM	12h 30m 35s	+ 1m 45s	1:38 PM	65.7°	149.536
3-Apr-10	7:21 AM	7:54 PM	12h 32m 20s	+ 1m 45s	1:37 PM	66.1°	149.58
4-Apr-10	7:20 AM	7:54 PM	12h 34m 05s	+ 1m 44s	1:37 PM	66.5°	149.623
5-Apr-10	7:19 AM	7:55 PM	12h 35m 50s	+ 1m 44s	1:37 PM	66.8°	149.667
6-Apr-10	7:18 AM	7:55 PM	12h 37m 34s	+ 1m 44s	1:36 PM	67.2°	149.711
7-Apr-10	7:17 AM	7:56 PM	12h 39m 18s	+ 1m 44s	1:36 PM	67.6°	149.755
8-Apr-10	7:15 AM	7:57 PM	12h 41m 02s	+ 1m 43s	1:36 PM	68.0°	149.799
9-Apr-10	7:14 AM	7:57 PM	12h 42m 45s	+ 1m 43s	1:36 PM	68.3°	149.842
10-Apr-10	7:13 AM	7:58 PM	12h 44m 28s	+ 1m 43s	1:35 PM	68.7°	149.886
11-Apr-10	7:12 AM	7:58 PM	12h 46m 11s	+ 1m 42s	1:35 PM	69.1°	149.929
12-Apr-10	7:11 AM	7:59 PM	12h 47m 53s	+ 1m 42s	1:35 PM	69.4°	149.971
13-Apr-10	7:10 AM	8:00 PM	12h 49m 35s	+ 1m 41s	1:34 PM	69.8°	150.014
14-Apr-10	7:09 AM	8:00 PM	12h 51m 17s	+ 1m 41s	1:34 PM	70.2°	150.056
15-Apr-10	7:08 AM	8:01 PM	12h 52m 58s	+ 1m 40s	1:34 PM	70.5°	150.098
16-Apr-10	7:07 AM	8:01 PM	12h 54m 38s	+ 1m 40s	1:34 PM	70.9°	150.139
17-Apr-10	7:06 AM	8:02 PM	12h 56m 18s	+ 1m 39s	1:34 PM	71.2°	150.18
18-Apr-10	7:05 AM	8:03 PM	12h 57m 58s	+ 1m 39s	1:33 PM	71.6°	150.221
19-Apr-10	7:03 AM	8:03 PM	12h 59m 36s	+ 1m 38s	1:33 PM	71.9°	150.261
20-Apr-10	7:02 AM	8:04 PM	13h 01m 15s	+ 1m 38s	1:33 PM	72.3°	150.302
21-Apr-10	7:01 AM	8:04 PM	13h 02m 52s	+ 1m 37s	1:33 PM	72.6°	150.341
22-Apr-10	7:00 AM	8:05 PM	13h 04m 30s	+ 1m 37s	1:32 PM	72.9°	150.381
23-Apr-10	6:59 AM	8:06 PM	13h 06m 06s	+ 1m 36s	1:32 PM	73.3°	150.421
24-Apr-10	6:58 AM	8:06 PM	13h 07m 42s	+ 1m 35s	1:32 PM	73.6°	150.46
25-Apr-10	6:58 AM	8:07 PM	13h 09m 17s	+ 1m 34s	1:32 PM	73.9°	150.499
26-Apr-10	6:57 AM	8:07 PM	13h 10m 51s	+ 1m 34s	1:32 PM	74.2°	150.538
27-Apr-10	6:56 AM	8:08 PM	13h 12m 24s	+ 1m 33s	1:32 PM	74.6°	150.577
28-Apr-10	6:55 AM	8:09 PM	13h 13m 57s	+ 1m 32s	1:31 PM	74.9°	150.616
29-Apr-10	6:54 AM	8:09 PM	13h 15m 29s	+ 1m 31s	1:31 PM	75.2°	150.655
30-Apr-10	6:53 AM	8:10 PM	13h 17m 00s	+ 1m 30s	1:31 PM	75.5°	150.694

Sunrise Sunset Times for San ANtonio, Texas in May 2010

Rising and setting times for the Sun

Date	Sunrise	Sunset	Length of day: This day	Length of day: Difference	Solar noon: Time	Solar noon: Altitude	Distance (10^6 km)
1-May-10	6:52 AM	8:11 PM	13h 18m 30s	+ 1m 30s	1:31 PM	75.8°	150.732
2-May-10	6:51 AM	8:11 PM	13h 19m 59s	+ 1m 29s	1:31 PM	76.1°	150.771
3-May-10	6:50 AM	8:12 PM	13h 21m 27s	+ 1m 28s	1:31 PM	76.4°	150.809
4-May-10	6:49 AM	8:12 PM	13h 22m 54s	+ 1m 27s	1:31 PM	76.7°	150.847
5-May-10	6:49 AM	8:13 PM	13h 24m 21s	+ 1m 26s	1:31 PM	77.0°	150.885
6-May-10	6:48 AM	8:14 PM	13h 25m 46s	+ 1m 25s	1:31 PM	77.2°	150.922
7-May-10	6:47 AM	8:14 PM	13h 27m 10s	+ 1m 24s	1:31 PM	77.5°	150.959
8-May-10	6:46 AM	8:15 PM	13h 28m 33s	+ 1m 22s	1:30 PM	77.8°	150.995
9-May-10	6:46 AM	8:16 PM	13h 29m 55s	+ 1m 21s	1:30 PM	78.1°	151.031
10-May-10	6:45 AM	8:16 PM	13h 31m 16s	+ 1m 20s	1:30 PM	78.3°	151.066
11-May-10	6:44 AM	8:17 PM	13h 32m 35s	+ 1m 19s	1:30 PM	78.6°	151.101
12-May-10	6:44 AM	8:17 PM	13h 33m 53s	+ 1m 18s	1:30 PM	78.8°	151.135
13-May-10	6:43 AM	8:18 PM	13h 35m 10s	+ 1m 16s	1:30 PM	79.1°	151.168
14-May-10	6:42 AM	8:19 PM	13h 36m 25s	+ 1m 15s	1:30 PM	79.3°	151.201
15-May-10	6:42 AM	8:19 PM	13h 37m 39s	+ 1m 14s	1:30 PM	79.6°	151.233
16-May-10	6:41 AM	8:20 PM	13h 38m 52s	+ 1m 12s	1:30 PM	79.8°	151.264
17-May-10	6:41 AM	8:21 PM	13h 40m 03s	+ 1m 11s	1:30 PM	80.0°	151.295
18-May-10	6:40 AM	8:21 PM	13h 41m 13s	+ 1m 09s	1:30 PM	80.2°	151.325
19-May-10	6:39 AM	8:22 PM	13h 42m 21s	+ 1m 08s	1:30 PM	80.4°	151.354
20-May-10	6:39 AM	8:22 PM	13h 43m 28s	+ 1m 06s	1:31 PM	80.7°	151.383
21-May-10	6:38 AM	8:23 PM	13h 44m 33s	+ 1m 04s	1:31 PM	80.9°	151.411
22-May-10	6:38 AM	8:24 PM	13h 45m 36s	+ 1m 03s	1:31 PM	81.1°	151.439
23-May-10	6:38 AM	8:24 PM	13h 46m 38s	+ 1m 01s	1:31 PM	81.2°	151.467
24-May-10	6:37 AM	8:25 PM	13h 47m 38s	+ 59s	1:31 PM	81.4°	151.494
25-May-10	6:37 AM	8:25 PM	13h 48m 36s	+ 58s	1:31 PM	81.6°	151.52
26-May-10	6:36 AM	8:26 PM	13h 49m 32s	+ 56s	1:31 PM	81.8°	151.546
27-May-10	6:36 AM	8:27 PM	13h 50m 27s	+ 54s	1:31 PM	82.0°	151.572
28-May-10	6:36 AM	8:27 PM	13h 51m 20s	+ 52s	1:31 PM	82.1°	151.598
29-May-10	6:35 AM	8:28 PM	13h 52m 10s	+ 50s	1:31 PM	82.3°	151.623
30-May-10	6:35 AM	8:28 PM	13h 52m 59s	+ 48s	1:32 PM	82.4°	151.647
31-May-10	6:35 AM	8:29 PM	13h 53m 46s	+ 46s	1:32 PM	82.6°	151.672

Sunrise Sunset Times for San Antonio, Texas in June 2010

Rising and setting times for the Sun

			Length of day		Solar noon		
Date	Sunrise	Sunset	This day	Difference	Time	Altitude	Distance (10^6 km)
1-Jun-10	6:35 AM	8:29 PM	13h 54m 31s	+ 44s	1:32 PM	82.7°	151.695
2-Jun-10	6:34 AM	8:30 PM	13h 55m 14s	+ 42s	1:32 PM	82.8°	151.719
3-Jun-10	6:34 AM	8:30 PM	13h 55m 55s	+ 40s	1:32 PM	83.0°	151.741
4-Jun-10	6:34 AM	8:31 PM	13h 56m 34s	+ 38s	1:32 PM	83.1°	151.764
5-Jun-10	6:34 AM	8:31 PM	13h 57m 10s	+ 36s	1:33 PM	83.2°	151.785
6-Jun-10	6:34 AM	8:32 PM	13h 57m 45s	+ 34s	1:33 PM	83.3°	151.806
7-Jun-10	6:34 AM	8:32 PM	13h 58m 17s	+ 32s	1:33 PM	83.4°	151.826
8-Jun-10	6:34 AM	8:33 PM	13h 58m 48s	+ 30s	1:33 PM	83.5°	151.846
9-Jun-10	6:34 AM	8:33 PM	13h 59m 16s	+ 28s	1:33 PM	83.6°	151.864
10-Jun-10	6:34 AM	8:33 PM	13h 59m 42s	+ 25s	1:33 PM	83.6°	151.882
11-Jun-10	6:34 AM	8:34 PM	14h 00m 05s	+ 23s	1:34 PM	83.7°	151.899
12-Jun-10	6:34 AM	8:34 PM	14h 00m 26s	+ 21s	1:34 PM	83.8°	151.915
13-Jun-10	6:34 AM	8:35 PM	14h 00m 45s	+ 19s	1:34 PM	83.8°	151.93
14-Jun-10	6:34 AM	8:35 PM	14h 01m 02s	+ 16s	1:34 PM	83.9°	151.944
15-Jun-10	6:34 AM	8:35 PM	14h 01m 17s	+ 14s	1:35 PM	83.9°	151.958
16-Jun-10	6:34 AM	8:36 PM	14h 01m 29s	+ 12s	1:35 PM	83.9°	151.97
17-Jun-10	6:34 AM	8:36 PM	14h 01m 39s	+ 09s	1:35 PM	84.0°	151.982
18-Jun-10	6:34 AM	8:36 PM	14h 01m 46s	+ 07s	1:35 PM	84.0°	151.993
19-Jun-10	6:34 AM	8:36 PM	14h 01m 51s	+ 05s	1:35 PM	84.0°	152.003
20-Jun-10	6:35 AM	8:37 PM	14h 01m 54s	+ 02s	1:36 PM	84.0°	152.013
21-Jun-10	6:35 AM	8:37 PM	14h 01m 54s	< 1s	1:36 PM	84.0°	152.022
22-Jun-10	6:35 AM	8:37 PM	14h 01m 52s	− 01s	1:36 PM	84.0°	152.03
23-Jun-10	6:35 AM	8:37 PM	14h 01m 48s	− 04s	1:36 PM	84.0°	152.038
24-Jun-10	6:36 AM	8:37 PM	14h 01m 42s	− 06s	1:36 PM	84.0°	152.045
25-Jun-10	6:36 AM	8:37 PM	14h 01m 33s	− 08s	1:37 PM	84.0°	152.052
26-Jun-10	6:36 AM	8:38 PM	14h 01m 21s	− 11s	1:37 PM	83.9°	152.058
27-Jun-10	6:36 AM	8:38 PM	14h 01m 08s	− 13s	1:37 PM	83.9°	152.064
28-Jun-10	6:37 AM	8:38 PM	14h 00m 53s	− 15s	1:37 PM	83.8°	152.069
29-Jun-10	6:37 AM	8:38 PM	14h 00m 34s	− 18s	1:38 PM	83.8°	152.074
30-Jun-10	6:38 AM	8:38 PM	14h 00m 14s	− 20s	1:38 PM	83.7°	152.078

Sunrise Sunset Times for San ANtonio, Texas in July 2010

Rising and setting times for the Sun

Date	Sunrise	Sunset	Length of day		Solar noon		
			This day	Difference	Time	Altitude	Distance (10^6 km)
1-Jul-10	6:38 AM	8:38 PM	13h 59m 52s	− 22s	1:38 PM	83.7°	152.082
2-Jul-10	6:38 AM	8:38 PM	13h 59m 27s	− 25s	1:38 PM	83.6°	152.085
3-Jul-10	6:39 AM	8:38 PM	13h 59m 00s	− 27s	1:38 PM	83.5°	152.087
4-Jul-10	6:39 AM	8:38 PM	13h 58m 31s	− 29s	1:38 PM	83.4°	152.089
5-Jul-10	6:40 AM	8:38 PM	13h 57m 59s	− 31s	1:39 PM	83.3°	152.09
6-Jul-10	6:40 AM	8:37 PM	13h 57m 26s	− 33s	1:39 PM	83.2°	152.09
7-Jul-10	6:40 AM	8:37 PM	13h 56m 50s	− 35s	1:39 PM	83.1°	152.089
8-Jul-10	6:41 AM	8:37 PM	13h 56m 12s	− 37s	1:39 PM	83.0°	152.088
9-Jul-10	6:41 AM	8:37 PM	13h 55m 32s	− 39s	1:39 PM	82.9°	152.085
10-Jul-10	6:42 AM	8:37 PM	13h 54m 51s	− 41s	1:39 PM	82.8°	152.082
11-Jul-10	6:42 AM	8:36 PM	13h 54m 07s	− 43s	1:40 PM	82.6°	152.078
12-Jul-10	6:43 AM	8:36 PM	13h 53m 21s	− 45s	1:40 PM	82.5°	152.073
13-Jul-10	6:43 AM	8:36 PM	13h 52m 33s	− 47s	1:40 PM	82.3°	152.067
14-Jul-10	6:44 AM	8:36 PM	13h 51m 43s	− 49s	1:40 PM	82.2°	152.06
15-Jul-10	6:44 AM	8:35 PM	13h 50m 52s	− 51s	1:40 PM	82.0°	152.052
16-Jul-10	6:45 AM	8:35 PM	13h 49m 58s	− 53s	1:40 PM	81.9°	152.043
17-Jul-10	6:46 AM	8:35 PM	13h 49m 03s	− 55s	1:40 PM	81.7°	152.034
18-Jul-10	6:46 AM	8:34 PM	13h 48m 06s	− 56s	1:40 PM	81.5°	152.023
19-Jul-10	6:47 AM	8:34 PM	13h 47m 07s	− 58s	1:40 PM	81.3°	152.012
20-Jul-10	6:47 AM	8:33 PM	13h 46m 07s	− 1m 00s	1:40 PM	81.2°	152.001
21-Jul-10	6:48 AM	8:33 PM	13h 45m 05s	− 1m 02s	1:40 PM	81.0°	151.989
22-Jul-10	6:48 AM	8:32 PM	13h 44m 01s	− 1m 03s	1:40 PM	80.8°	151.976
23-Jul-10	6:49 AM	8:32 PM	13h 42m 56s	− 1m 05s	1:41 PM	80.6°	151.963
24-Jul-10	6:49 AM	8:31 PM	13h 41m 49s	− 1m 06s	1:41 PM	80.4°	151.949
25-Jul-10	6:50 AM	8:31 PM	13h 40m 41s	− 1m 08s	1:41 PM	80.1°	151.934
26-Jul-10	6:51 AM	8:30 PM	13h 39m 31s	− 1m 09s	1:41 PM	79.9°	151.92
27-Jul-10	6:51 AM	8:30 PM	13h 38m 20s	− 1m 11s	1:41 PM	79.7°	151.904
28-Jul-10	6:52 AM	8:29 PM	13h 37m 07s	− 1m 12s	1:41 PM	79.5°	151.889
29-Jul-10	6:52 AM	8:28 PM	13h 35m 53s	− 1m 13s	1:40 PM	79.2°	151.873
30-Jul-10	6:53 AM	8:28 PM	13h 34m 38s	− 1m 15s	1:40 PM	79.0°	151.856
31-Jul-10	6:54 AM	8:27 PM	13h 33m 22s	− 1m 16s	1:40 PM	78.7°	151.839

Sunrise Sunset Times for San ANtonio, Texas in August 2010

Rising and setting times for the Sun

Date	Sunrise	Sunset	Length of day This day	Length of day Difference	Solar noon Time	Solar noon Altitude	Distance (10^6 km)
1-Aug-10	6:54 AM	8:26 PM	13h 32m 04s	− 1m 17s	1:40 PM	78.5°	151.821
2-Aug-10	6:55 AM	8:25 PM	13h 30m 45s	− 1m 19s	1:40 PM	78.2°	151.803
3-Aug-10	6:55 AM	8:25 PM	13h 29m 24s	− 1m 20s	1:40 PM	78.0°	151.784
4-Aug-10	6:56 AM	8:24 PM	13h 28m 03s	− 1m 21s	1:40 PM	77.7°	151.764
5-Aug-10	6:56 AM	8:23 PM	13h 26m 40s	− 1m 22s	1:40 PM	77.4°	151.743
6-Aug-10	6:57 AM	8:22 PM	13h 25m 17s	− 1m 23s	1:40 PM	77.2°	151.722
7-Aug-10	6:58 AM	8:21 PM	13h 23m 52s	− 1m 24s	1:40 PM	76.9°	151.7
8-Aug-10	6:58 AM	8:21 PM	13h 22m 27s	− 1m 25s	1:40 PM	76.6°	151.678
9-Aug-10	6:59 AM	8:20 PM	13h 21m 00s	− 1m 26s	1:39 PM	76.3°	151.654
10-Aug-10	6:59 AM	8:19 PM	13h 19m 32s	− 1m 27s	1:39 PM	76.0°	151.63
11-Aug-10	7:00 AM	8:18 PM	13h 18m 04s	− 1m 28s	1:39 PM	75.7°	151.605
12-Aug-10	7:01 AM	8:17 PM	13h 16m 35s	− 1m 29s	1:39 PM	75.4°	151.579
13-Aug-10	7:01 AM	8:16 PM	13h 15m 04s	− 1m 30s	1:39 PM	75.1°	151.552
14-Aug-10	7:02 AM	8:15 PM	13h 13m 33s	− 1m 31s	1:39 PM	74.8°	151.525
15-Aug-10	7:02 AM	8:14 PM	13h 12m 01s	− 1m 31s	1:38 PM	74.5°	151.497
16-Aug-10	7:03 AM	8:13 PM	13h 10m 29s	− 1m 32s	1:38 PM	74.2°	151.468
17-Aug-10	7:03 AM	8:12 PM	13h 08m 56s	− 1m 33s	1:38 PM	73.9°	151.439
18-Aug-10	7:04 AM	8:11 PM	13h 07m 22s	− 1m 33s	1:38 PM	73.5°	151.409
19-Aug-10	7:04 AM	8:10 PM	13h 05m 47s	− 1m 34s	1:38 PM	73.2°	151.379
20-Aug-10	7:05 AM	8:09 PM	13h 04m 12s	− 1m 35s	1:37 PM	72.9°	151.348
21-Aug-10	7:06 AM	8:08 PM	13h 02m 36s	− 1m 35s	1:37 PM	72.5°	151.317
22-Aug-10	7:06 AM	8:07 PM	13h 00m 59s	− 1m 36s	1:37 PM	72.2°	151.286
23-Aug-10	7:07 AM	8:06 PM	12h 59m 22s	− 1m 37s	1:37 PM	71.9°	151.254
24-Aug-10	7:07 AM	8:05 PM	12h 57m 45s	− 1m 37s	1:36 PM	71.5°	151.222
25-Aug-10	7:08 AM	8:04 PM	12h 56m 07s	− 1m 38s	1:36 PM	71.2°	151.19
26-Aug-10	7:08 AM	8:03 PM	12h 54m 28s	− 1m 38s	1:36 PM	70.8°	151.158
27-Aug-10	7:09 AM	8:02 PM	12h 52m 49s	− 1m 39s	1:35 PM	70.5°	151.125
28-Aug-10	7:09 AM	8:01 PM	12h 51m 09s	− 1m 39s	1:35 PM	70.1°	151.092
29-Aug-10	7:10 AM	7:59 PM	12h 49m 29s	− 1m 39s	1:35 PM	69.8°	151.058
30-Aug-10	7:10 AM	7:58 PM	12h 47m 49s	− 1m 40s	1:35 PM	69.4°	151.025
31-Aug-10	7:11 AM	7:57 PM	12h 46m 08s	− 1m 40s	1:34 PM	69.1°	150.991

Sunrise Sunset Times for San ANtonio, Texas in September 2010

Rising and setting times for the Sun

Date	Sunrise	Sunset	Length of day This day	Length of day Difference	Solar noon Time	Solar noon Altitude	Distance (10^6 km)
1-Sep-10	7:11 AM	7:56 PM	12h 44m 27s	− 1m 41s	1:34 PM	68.7°	150.956
2-Sep-10	7:12 AM	7:55 PM	12h 42m 45s	− 1m 41s	1:34 PM	68.3°	150.921
3-Sep-10	7:13 AM	7:54 PM	12h 41m 03s	− 1m 41s	1:33 PM	68.0°	150.886
4-Sep-10	7:13 AM	7:52 PM	12h 39m 21s	− 1m 42s	1:33 PM	67.6°	150.85
5-Sep-10	7:14 AM	7:51 PM	12h 37m 39s	− 1m 42s	1:33 PM	67.2°	150.814
6-Sep-10	7:14 AM	7:50 PM	12h 35m 56s	− 1m 42s	1:32 PM	66.9°	150.777
7-Sep-10	7:15 AM	7:49 PM	12h 34m 13s	− 1m 43s	1:32 PM	66.5°	150.74
8-Sep-10	7:15 AM	7:48 PM	12h 32m 29s	− 1m 43s	1:32 PM	66.1°	150.702
9-Sep-10	7:16 AM	7:46 PM	12h 30m 46s	− 1m 43s	1:31 PM	65.7°	150.663
10-Sep-10	7:16 AM	7:45 PM	12h 29m 02s	− 1m 43s	1:31 PM	65.4°	150.624
11-Sep-10	7:17 AM	7:44 PM	12h 27m 18s	− 1m 44s	1:31 PM	65.0°	150.585
12-Sep-10	7:17 AM	7:43 PM	12h 25m 34s	− 1m 44s	1:30 PM	64.6°	150.545
13-Sep-10	7:18 AM	7:42 PM	12h 23m 49s	− 1m 44s	1:30 PM	64.2°	150.505
14-Sep-10	7:18 AM	7:40 PM	12h 22m 05s	− 1m 44s	1:30 PM	63.8°	150.464
15-Sep-10	7:19 AM	7:39 PM	12h 20m 20s	− 1m 44s	1:29 PM	63.4°	150.423
16-Sep-10	7:19 AM	7:38 PM	12h 18m 35s	− 1m 44s	1:29 PM	63.1°	150.381
17-Sep-10	7:20 AM	7:37 PM	12h 16m 50s	− 1m 44s	1:28 PM	62.7°	150.34
18-Sep-10	7:20 AM	7:35 PM	12h 15m 05s	− 1m 44s	1:28 PM	62.3°	150.298
19-Sep-10	7:21 AM	7:34 PM	12h 13m 20s	− 1m 45s	1:28 PM	61.9°	150.256
20-Sep-10	7:21 AM	7:33 PM	12h 11m 35s	− 1m 45s	1:27 PM	61.5°	150.215
21-Sep-10	7:22 AM	7:32 PM	12h 09m 50s	− 1m 45s	1:27 PM	61.1°	150.173
22-Sep-10	7:22 AM	7:30 PM	12h 08m 05s	− 1m 45s	1:27 PM	60.7°	150.131
23-Sep-10	7:23 AM	7:29 PM	12h 06m 20s	− 1m 45s	1:26 PM	60.3°	150.089
24-Sep-10	7:23 AM	7:28 PM	12h 04m 34s	− 1m 45s	1:26 PM	60.0°	150.047
25-Sep-10	7:24 AM	7:27 PM	12h 02m 49s	− 1m 45s	1:26 PM	59.6°	150.006
26-Sep-10	7:25 AM	7:26 PM	12h 01m 04s	− 1m 45s	1:25 PM	59.2°	149.964
27-Sep-10	7:25 AM	7:24 PM	11h 59m 19s	− 1m 45s	1:25 PM	58.8°	149.922
28-Sep-10	7:26 AM	7:23 PM	11h 57m 34s	− 1m 45s	1:25 PM	58.4°	149.881
29-Sep-10	7:26 AM	7:22 PM	11h 55m 49s	− 1m 45s	1:24 PM	58.0°	149.839
30-Sep-10	7:27 AM	7:21 PM	11h 54m 04s	− 1m 45s	1:24 PM	57.6°	149.797

All times are in local time for San Antonio

Sunrise Sunset Times for San ANtonio, Texas in October 2010

Rising and setting times for the Sun

Date	Sunrise	Sunset	Length of day: This day	Length of day: Difference	Solar noon: Time	Solar noon: Altitude	Distance (10^6 km)
1-Oct-10	7:27 AM	7:20 PM	11h 52m 19s	− 1m 44s	1:24 PM	57.2°	149.756
2-Oct-10	7:28 AM	7:18 PM	11h 50m 34s	− 1m 44s	1:23 PM	56.8°	149.714
3-Oct-10	7:28 AM	7:17 PM	11h 48m 49s	− 1m 44s	1:23 PM	56.5°	149.672
4-Oct-10	7:29 AM	7:16 PM	11h 47m 05s	− 1m 44s	1:23 PM	56.1°	149.63
5-Oct-10	7:29 AM	7:15 PM	11h 45m 20s	− 1m 44s	1:22 PM	55.7°	149.587
6-Oct-10	7:30 AM	7:14 PM	11h 43m 36s	− 1m 44s	1:22 PM	55.3°	149.545
7-Oct-10	7:31 AM	7:13 PM	11h 41m 52s	− 1m 44s	1:22 PM	54.9°	149.502
8-Oct-10	7:31 AM	7:11 PM	11h 40m 08s	− 1m 43s	1:21 PM	54.5°	149.459
9-Oct-10	7:32 AM	7:10 PM	11h 38m 24s	− 1m 43s	1:21 PM	54.2°	149.416
10-Oct-10	7:32 AM	7:09 PM	11h 36m 41s	− 1m 43s	1:21 PM	53.8°	149.373
11-Oct-10	7:33 AM	7:08 PM	11h 34m 58s	− 1m 43s	1:21 PM	53.4°	149.33
12-Oct-10	7:34 AM	7:07 PM	11h 33m 15s	− 1m 42s	1:20 PM	53.0°	149.286
13-Oct-10	7:34 AM	7:06 PM	11h 31m 32s	− 1m 42s	1:20 PM	52.7°	149.243
14-Oct-10	7:35 AM	7:05 PM	11h 29m 50s	− 1m 42s	1:20 PM	52.3°	149.199
15-Oct-10	7:35 AM	7:04 PM	11h 28m 08s	− 1m 41s	1:20 PM	51.9°	149.156
16-Oct-10	7:36 AM	7:03 PM	11h 26m 26s	− 1m 41s	1:20 PM	51.5°	149.113
17-Oct-10	7:37 AM	7:02 PM	11h 24m 45s	− 1m 41s	1:19 PM	51.2°	149.07
18-Oct-10	7:37 AM	7:00 PM	11h 23m 05s	− 1m 40s	1:19 PM	50.8°	149.027
19-Oct-10	7:38 AM	6:59 PM	11h 21m 24s	− 1m 40s	1:19 PM	50.5°	148.984
20-Oct-10	7:39 AM	6:58 PM	11h 19m 44s	− 1m 39s	1:19 PM	50.1°	148.942
21-Oct-10	7:39 AM	6:57 PM	11h 18m 05s	− 1m 39s	1:19 PM	49.7°	148.9
22-Oct-10	7:40 AM	6:56 PM	11h 16m 27s	− 1m 38s	1:18 PM	49.4°	148.859
23-Oct-10	7:41 AM	6:56 PM	11h 14m 48s	− 1m 38s	1:18 PM	49.0°	148.818
24-Oct-10	7:41 AM	6:55 PM	11h 13m 11s	− 1m 37s	1:18 PM	48.7°	148.777
25-Oct-10	7:42 AM	6:54 PM	11h 11m 33s	− 1m 37s	1:18 PM	48.3°	148.737
26-Oct-10	7:43 AM	6:53 PM	11h 09m 57s	− 1m 36s	1:18 PM	48.0°	148.697
27-Oct-10	7:43 AM	6:52 PM	11h 08m 21s	− 1m 35s	1:18 PM	47.7°	148.658
28-Oct-10	7:44 AM	6:51 PM	11h 06m 46s	− 1m 35s	1:18 PM	47.3°	148.619
29-Oct-10	7:45 AM	6:50 PM	11h 05m 11s	− 1m 34s	1:18 PM	47.0°	148.58
30-Oct-10	7:46 AM	6:49 PM	11h 03m 38s	− 1m 33s	1:18 PM	46.7°	148.542
31-Oct-10	7:46 AM	6:48 PM	11h 02m 05s	− 1m 32s	1:18 PM	46.4°	148.504

All times are in local time for San Antonio

Sunrise Sunset Times for San ANtonio, Texas in November 2010

Rising and setting times for the Sun

Date	Sunrise	Sunset	Length of day: This day	Length of day: Difference	Solar noon: Time	Solar noon: Altitude	Solar noon: Distance (10^6 km)
1-Nov-10	7:47 AM	6:48 PM	11h 00m 32s	− 1m 32s	1:18 PM	46.0°	148.466
2-Nov-10	7:48 AM	6:47 PM	10h 59m 01s	− 1m 31s	1:18 PM	45.7°	148.428
3-Nov-10	7:49 AM	6:46 PM	10h 57m 31s	− 1m 30s	1:18 PM	45.4°	148.391
4-Nov-10	7:49 AM	6:45 PM	10h 56m 01s	− 1m 29s	1:18 PM	45.1°	148.354
5-Nov-10	7:50 AM	6:45 PM	10h 54m 32s	− 1m 28s	1:18 PM	44.8°	148.317
6-Nov-10	7:51 AM	6:44 PM	10h 53m 05s	− 1m 27s	1:18 PM	44.5°	148.28
Note: hours shift because clocks change backward 1 hour (See below table for details)							
7-Nov-10	6:52 AM	5:43 PM	10h 51m 38s	− 1m 26s	12:18 PM	44.2°	148.243
8-Nov-10	6:52 AM	5:43 PM	10h 50m 13s	− 1m 25s	12:18 PM	43.9°	148.207
9-Nov-10	6:53 AM	5:42 PM	10h 48m 48s	− 1m 24s	12:18 PM	43.6°	148.171
10-Nov-10	6:54 AM	5:42 PM	10h 47m 25s	− 1m 23s	12:18 PM	43.3°	148.135
11-Nov-10	6:55 AM	5:41 PM	10h 46m 03s	− 1m 22s	12:18 PM	43.1°	148.099
12-Nov-10	6:56 AM	5:40 PM	10h 44m 42s	− 1m 20s	12:18 PM	42.8°	148.064
13-Nov-10	6:56 AM	5:40 PM	10h 43m 22s	− 1m 19s	12:18 PM	42.5°	148.029
14-Nov-10	6:57 AM	5:39 PM	10h 42m 04s	− 1m 18s	12:18 PM	42.3°	147.994
15-Nov-10	6:58 AM	5:39 PM	10h 40m 47s	− 1m 16s	12:19 PM	42.0°	147.96
16-Nov-10	6:59 AM	5:38 PM	10h 39m 32s	− 1m 15s	12:19 PM	41.8°	147.927
17-Nov-10	7:00 AM	5:38 PM	10h 38m 18s	− 1m 14s	12:19 PM	41.5°	147.894
18-Nov-10	7:01 AM	5:38 PM	10h 37m 05s	− 1m 12s	12:19 PM	41.3°	147.862
19-Nov-10	7:01 AM	5:37 PM	10h 35m 54s	− 1m 11s	12:19 PM	41.0°	147.83
20-Nov-10	7:02 AM	5:37 PM	10h 34m 45s	− 1m 09s	12:20 PM	40.8°	147.799
21-Nov-10	7:03 AM	5:37 PM	10h 33m 37s	− 1m 07s	12:20 PM	40.6°	147.769
22-Nov-10	7:04 AM	5:36 PM	10h 32m 31s	− 1m 06s	12:20 PM	40.4°	147.74
23-Nov-10	7:05 AM	5:36 PM	10h 31m 26s	− 1m 04s	12:20 PM	40.2°	147.711
24-Nov-10	7:05 AM	5:36 PM	10h 30m 23s	− 1m 02s	12:21 PM	40.0°	147.684
25-Nov-10	7:06 AM	5:36 PM	10h 29m 22s	− 1m 00s	12:21 PM	39.8°	147.657
26-Nov-10	7:07 AM	5:35 PM	10h 28m 23s	− 59s	12:21 PM	39.6°	147.63
27-Nov-10	7:08 AM	5:35 PM	10h 27m 26s	− 57s	12:22 PM	39.4°	147.605
28-Nov-10	7:09 AM	5:35 PM	10h 26m 31s	− 55s	12:22 PM	39.2°	147.579
29-Nov-10	7:09 AM	5:35 PM	10h 25m 38s	− 53s	12:22 PM	39.1°	147.555
30-Nov-10	7:10 AM	5:35 PM	10h 24m 46s	− 51s	12:23 PM	38.9°	147.531

Sunrise Sunset Times for San ANtonio, Texas in December 2010

Date	Sunrise	Sunset	Length of day		Solar noon		
			This day	Difference	Time	Altitude	Distance (10^6 km)
1-Dec-10	7:11 AM	5:35 PM	10h 23m 57s	− 49s	12:23 PM	38.7°	147.508
2-Dec-10	7:12 AM	5:35 PM	10h 23m 10s	− 47s	12:23 PM	38.6°	147.485
3-Dec-10	7:13 AM	5:35 PM	10h 22m 25s	− 45s	12:24 PM	38.4°	147.463
4-Dec-10	7:13 AM	5:35 PM	10h 21m 42s	− 42s	12:24 PM	38.3°	147.441
5-Dec-10	7:14 AM	5:35 PM	10h 21m 01s	− 40s	12:25 PM	38.2°	147.42
6-Dec-10	7:15 AM	5:35 PM	10h 20m 23s	− 38s	12:25 PM	38.1°	147.399
7-Dec-10	7:16 AM	5:35 PM	10h 19m 47s	− 36s	12:26 PM	37.9°	147.378
8-Dec-10	7:16 AM	5:36 PM	10h 19m 13s	− 33s	12:26 PM	37.8°	147.358
9-Dec-10	7:17 AM	5:36 PM	10h 18m 42s	− 31s	12:26 PM	37.7°	147.339
10-Dec-10	7:18 AM	5:36 PM	10h 18m 12s	− 29s	12:27 PM	37.7°	147.32
11-Dec-10	7:18 AM	5:36 PM	10h 17m 46s	− 26s	12:27 PM	37.6°	147.301
12-Dec-10	7:19 AM	5:36 PM	10h 17m 21s	− 24s	12:28 PM	37.5°	147.284
13-Dec-10	7:20 AM	5:37 PM	10h 16m 59s	− 21s	12:28 PM	37.4°	147.266
14-Dec-10	7:20 AM	5:37 PM	10h 16m 40s	− 19s	12:29 PM	37.4°	147.25
15-Dec-10	7:21 AM	5:37 PM	10h 16m 23s	− 16s	12:29 PM	37.3°	147.234
16-Dec-10	7:22 AM	5:38 PM	10h 16m 09s	− 14s	12:30 PM	37.3°	147.22
17-Dec-10	7:22 AM	5:38 PM	10h 15m 57s	− 11s	12:30 PM	37.2°	147.206
18-Dec-10	7:23 AM	5:39 PM	10h 15m 47s	− 09s	12:31 PM	37.2°	147.192
19-Dec-10	7:23 AM	5:39 PM	10h 15m 40s	− 06s	12:31 PM	37.2°	147.18
20-Dec-10	7:24 AM	5:39 PM	10h 15m 36s	− 04s	12:32 PM	37.2°	147.169
21-Dec-10	7:24 AM	5:40 PM	10h 15m 34s	− 01s	12:32 PM	37.2°	147.159
22-Dec-10	7:25 AM	5:40 PM	10h 15m 35s	< 1s	12:33 PM	37.2°	147.149
23-Dec-10	7:25 AM	5:41 PM	10h 15m 38s	+ 03s	12:33 PM	37.2°	147.141
24-Dec-10	7:26 AM	5:42 PM	10h 15m 44s	+ 05s	12:34 PM	37.2°	147.133
25-Dec-10	7:26 AM	5:42 PM	10h 15m 53s	+ 08s	12:34 PM	37.2°	147.127
26-Dec-10	7:27 AM	5:43 PM	10h 16m 03s	+ 10s	12:35 PM	37.3°	147.121
27-Dec-10	7:27 AM	5:43 PM	10h 16m 17s	+ 13s	12:35 PM	37.3°	147.116
28-Dec-10	7:27 AM	5:44 PM	10h 16m 33s	+ 15s	12:36 PM	37.3°	147.112
29-Dec-10	7:28 AM	5:45 PM	10h 16m 51s	+ 18s	12:36 PM	37.4°	147.109
30-Dec-10	7:28 AM	5:45 PM	10h 17m 12s	+ 20s	12:37 PM	37.5°	147.106
31-Dec-10	7:28 AM	5:46 PM	10h 17m 36s	+ 23s	12:37 PM	37.5°	147.104

REPORTED ELECTRIC BILLS	W/O	ELECTRICITY USAGE	RATE	COST
MILITARY FAMILY HOUSING	76901	246,801	0.1198	$ 29,566.76
TRAILER PARK & MFH ADM/MAINT	76902	5,079	0.1198	$ 608.46
MFH TOTAL		**251,880**		**$ 30,175.22**
HOSPITAL TOTAL	76903	**176,154**	0.1198	**$ 21,103.25**
COMMISARY TOTAL	76904	**56,500**	0.1198	**$ 6,768.70**
BASE TOTAL (LESS REIMB+RIO)	76900	**3,696,425**	0.0989	**$ 365,637.23**
BASE TOTAL (INCLUDING REIMB)		**4,180,959**		**$ 423,684.40**

ACTUAL vs. REPORTED		USAGE	RATE	COST	
ACTUAL		4,180,959	0.1013	$ 423,684.40	
REPORTED		4,180,959	0.0989	$ 423,684.40	
DIFFERENCE		0	2.45%	$ -	
RUNNING ACTUAL		41,840,207		4,037,128	**0.096489189**
RUNNING REPORTED		41,840,207		4,037,128	
RUNNING DIFFERENCE		0		0	

ACTUAL ELECTRIC BILLS	W/O	ELECTRICITY USAGE	RATE	COST	
WEATHER RADAR SITE	8/21 - 9/22	19,837	$ 0.14709	$ 2,917.92	RGEC Invoice
SPOFFARD AUXILIARY FIELD	8/21 - 9/18	15,240	$ 0.14763	$ 2,249.83	RGEC Invoice
ENERGY Bill - Energy Cost Only	9/7 - 10/6	3,529,039	$ 0.00020	$ 698.55	Information Only
MAIN BASE UTILITY BILL - Energy + TDSP Charges	9/7 - 10/6	3,506,400	$ 0.13250	$ 464,595.19	BP Invoice
MIDDLE MARKER	8/14 - 9/15	8	$ 1.01419	$ 8.11	BP Invoice
AMISTAD #1 WATER WELL	9/8 - 10/6	8,480	$ 0.15830	$ 1,342.39	BP Invoice
SAN FELIPE SPRINGS	8/18 - 9/16	1,440	$ 0.48511	$ 698.55	BP Invoice
AMISTAD #2 NORTH RV CIRCLE	9/8 - 10/6	1,735	$ 0.17279	$ 299.79	BP Invoice
AMISTAD #3 BOAT HOUSE	9/8 - 10/6	5,614	$ 0.15812	$ 887.69	BP Invoice
AMISTAD #4 WEST RV PADS	9/8 - 10/6	5,362	$ 0.16336	$ 875.95	BP Invoice
RIO GRAND TOTAL		35,077	0.1473	**$ 5,167.75**	RGEC Invoice
Energy Services TOTAL		3,529,039	0.0002	**$ 698.55**	Information Only
Champion - TOTAL - Energy + TDSP Charges+ PUCT Fee		3,529,039	0.1328	**$ 468,707.68**	Champion Invoice
BASE TOTAL		**3,564,116**	0.132957	**$ 473,875.43**	

REPORTED ELECTRIC BILLS	W/O	ELECTRICITY USAGE	RATE	COST
MILITARY FAMILY HOUSING	76901	247,205	0.1423	$ 35,177.21
HOUSING OFFICE		3,301	0.1674	$ 552.59
MFH TOTAL		**250,506**		**$ 35,729.80**
HOSPITAL TOTAL	76903	**163,919**	0.1674	**$ 27,440.11**
COMMISARY TOTAL	76904	**53,200**	0.1674	**$ 8,905.68**
BASE TOTAL (LESS REIMB+RIO)	76900	**3,096,491**	0.1298	**$ 401,799.84**
BASE TOTAL (INCLUDING REIMB)		**3,564,116**		**$ 473,875.43**

ACTUAL ELECTRIC BILLS	W/O	ELECTRICITY USAGE	RATE		COST	
WEATHER RADAR SITE	6/22 - 7/21	21,772	$ 0.10444	$	2,273.81	RGEC Invoice
SPOFFARD AUXILIARY FIELD	6/18 - 7/20	20,520	$ 0.10454	$	2,145.07	RGEC Invoice
ENERGY Bill - Energy Cost Only	7/8 - 8/6	4,445,662	$ 0.00024	$	1,088.89	Information Only
MAIN BASE UTILITY BILL - Energy + TDSP Charges	7/8 - 8/6	4,410,472	$ 0.09467	$	417,540.68	BP Invoice
MIDDLE JulKER	6/16 - 7/16	8	$ 0.98414	$	7.87	BP Invoice
AMISTAD #1 WATER WELL	7/9 - 8/7	13,760	$ 0.12114	$	1,666.86	BP Invoice
SAN FELIPE SPRINGS	6/18 - 7/17	5,440	$ 0.20016	$	1,088.89	BP Invoice
AMISTAD #2 NORTH RV CIRCLE	7/9 - 8/7	2,033	$ 0.13932	$	283.23	BP Invoice
AMISTAD #3 BOAT HOUSE	7/9 - 8/7	6,962	$ 0.12252	$	852.95	BP Invoice
AMISTAD #4 WEST RV PADS	7/9 - 8/7	11,059	$ 0.12199	$	1,349.04	BP Invoice
RIO GRAND TOTAL		42,292	0.1045	**$**	**4,418.88**	RGEC Invoice
Energy Services TOTAL		4,449,734	0.0002	**$**	**1,088.89**	Information Only
Champion - TOTAL - Energy + TDSP Charges+ PUCT Fee		4,449,734	0.0950	**$**	**422,789.53**	Champion Invoice
BASE TOTAL		**4,492,026**	0.095104	**$**	**427,208.41**	

REPORTED ELECTRIC BILLS	W/O	ELECTRICITY USAGE	RATE		COST
MILITARY FAMILY HOUSING	76901	283,320	0.1201	$	34,026.68
HOUSING OFFICE		5,581	0.1223	$	682.56
MFH TOTAL		**288,901**		**$**	**34,709.24**
HOSPITAL TOTAL	76903	**185,605**	0.1223	**$**	**22,699.49**
COMMISARY TOTAL	76904	**54,900**	0.1223	**$**	**6,714.27**
BASE TOTAL (LESS REIMB+RIO)	76900	**3,962,621**	0.0916	**$**	**363,085.41**
BASE TOTAL (INCLUDING REIMB)		**4,492,026**		**$**	**427,208.41**

ACTUAL ELECTRIC BILLS	W/O	ELECTRICITY USAGE	RATE	COST	
WEATHER RADAR SITE	8/20 - 9/21	18,787	$ 0.12713	$ 2,388.38	RGEC Invoice
SPOFFARD AUXILIARY FIELD	8/21 - 9/21	18,600	$ 0.12715	$ 2,365.00	RGEC Invoice
Marina Harbor Boat Unit	9/7 - 10/6	28,771	$ 0.08511	$ 2,448.72	Information Only
MAIN BASE UTILITY BILL - Energy + TDSP Charges	9/7 - 10/6	3,720,823	$ 0.09678	$ 360,108.31	BP Invoice
MIDDLE SepKER	9/16 - 9/15	908	$ 0.07676	$ 69.70	BP Invoice
AMISTAD #1 WATER WELL	9/8 - 10/6	700,720	$ 0.06959	$ 48,765.82	BP Invoice
SAN FELIPE SPRINGS	9/19 - 9/17	150,240	$ 0.07369	$ 11,070.98	BP Invoice
AMISTAD #2 NORTH RV CIRCLE	9/8 - 10/6	986,679	$ 0.06891	$ 67,988.61	BP Invoice
AMISTAD #3 BOAT HOUSE	9/8 - 10/6	948,297	$ 0.06907	$ 65,503.26	BP Invoice
AMISTAD #4 WEST RV PADS	9/8 - 10/9	95,134	$ 0.07371	$ 7,012.79	BP Invoice
RIO GRAND TOTAL		37,387	0.1271	**$ 4,753.38**	RGEC Invoice
Energy Services TOTAL		6,602,801	0.0004	**$ 2,448.72**	Information Only
Champion - TOTAL - Energy + TDSP Charges+ PUCT Fee		6,602,801	0.0849	**$ 560,519.47**	Champion Invoice
BASE TOTAL		**6,640,188**	0.085129	**$ 565,272.85**	

REPORTED ELECTRIC BILLS	W/O	ELECTRICITY USAGE	RATE	COST
MILITARY FAMILY HOUSING	76901	247,431	0	$ -
HOUSING OFFICE		2,641	0	$ -
MFH TOTAL		**250,072**		**$ -**
HOSPITAL TOTAL	76903	**148,008**	0	**$ -**
COMMISARY TOTAL	76904	**46,000**	0	**$ -**
BASE TOTAL (LESS REIMB+RIO)	76900	**6,196,108**	0.0912	**$ 565,272.85**
BASE TOTAL (INCLUDING REIMB)		**6,640,188**		**$ 565,272.85**

11C. ECONOMIC ANALYSIS SECTION

Maintain Status Quo
Install PV Array by thrid party financer

11D. ECONOMIC JUSTIFICATION SUMMARY

Life-cycle Cost Analysis Data Base

1. Investment costs were developed Laughlin AFB personnel.

2. Life-Cycle costs were calculated using the National Institute of Standard and Technology Energy Price Indices and Discount Factors for Life-Cycle cost Analysis.

   a. Energy Savings Summary

Savings by using PV Array:	Life Cycle Cost	LifeCycle Savings (MWh)	Life Cycle Savings (MBtu)
Savings	$5.5M	61,592	210,159

   b. Net savings savings = $5,212,380
   c. Savings-to-Investment Ratio (SIR)= 105.25
   d. Adjusted Internal Rate of Return = 28.57%
   e. Simple Payback = 4
   f. Discounted Payback = 4

   g. Emissions Reduction Summary

Electricity	CO_2	SO_2	NO_x
Life-Cycle Reduction	54,520,361.28 kg	132,982.71 kg	114,428.16 kg

3. Energy Savings Calculations:

Due to the nature of this project, the MILCON Analysis with Alternatives method was used to caluclate Life Cycle Costs on the BLCC comparing our current electricity price with escalation to the price of a locked in electricty price with a small EIAP cost.

The Base case, what we do now, factors in no instatllation costs of any kind, but does account for the electricty consumption that would be produced by a PV Array here on base.

The alternative, what we would pay with a PV Array, accounts for the EIAP as the installation cost. It also, instead of putting the electricity used under the energy tab, accounts for the electricity produced by this renewable resource, purhased from a third party, under the annual O&M tab. This ensures that the emmission savings are calculated correctly, since the base case would be the only case that would produce emmisions, relatively speaking. This also accounts for the fixed rate payed every year for this chunk of the electricty used on base.

4. Closure Statement: This installation is not being considered for closure.

NIST BLCC 5.3-06: Comparative Analysis
Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: Current Utility Rate
Alternative: Rates with Solar

General Information
File Name: C:\Documents and Settings\amanda.smeeding\Desktop\projects\Laughlin

Projects\PV Array with Alternative.xml
Date of Study: Mon Feb 25 09:54:44 CST 2008
Project Name: MXDP 091023-PV Array
Project Location: Alabama
Analysis Type: MILCON Analysis, Energy Project
Analyst: AMS
Comment: Difference in current use with annual increase vs. renewable energy from PV Array at standard rate
Base Date: February 1, 2009
Beneficial Occupancy Date: February 1, 2010
Study Period: 21 years 0 months(February 1, 2009 through January 31, 2030)
Discount Rate: 3%
Discounting Convention: Mid-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

Initial Investment Costs:	Base Case	Alternative	Savings from Alternative
Capital Requirements as of Base Date	$0	$50,000	-$50,000
Future Costs:			
Energy Consumption Costs	$10,229,080	$0	$10,229,080
Energy Demand Charges	$0	$0	$0
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Routine Recurring and Non-Recurring OM&R Costs	$0	$4,966,701	-$4,966,701
Major Repair and Replacements	$0	$0	$0
Residual Value at End of Study Period	$0	$0	$0
	-------------	-------------	----------

Subtotal (for Future Cost Items)	$10,229,080	$4,966,701	$5,262,380
	------------	------------	------------
Total PV Life-Cycle Cost	$10,229,080	$5,016,701	$5,212,380

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	$5,262,380
- Increased Total Investment	$50,000

Net Savings	$5,212,380

Savings-to-Investment Ratio (SIR)

SIR = 105.25

Adjusted Internal Rate of Return

AIRR = 28.57%

Payback Period

Estimated Years to Payback (from beginning of Beneficial Occupancy Period)

Simple Payback occurs in year	4
Discounted Payback occurs in year	4

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy	-----Average Annual Consumption-----			Life-Cycle
Type	Base Case	Alternative	Savings	Savings
Electricity	3,080,000.0 kWh	0.0 kWh	3,080,000.0 kWh	61,591,567.4 kWh

Energy Savings Summary (in MBtu)

Energy	-----Average Annual Consumption-----			Life-Cycle
Type	Base Case	Alternative	Savings	Savings
Electricity	10,509.4 MBtu	0.0 MBtu	10,509.4 MBtu	210,159.1 MBtu

Emissions Reduction Summary

Energy	-----Average Annual Emissions-----			Life-Cycle
Type	Base Case	Alternative	Reduction	Reduction
Electricity				
CO2	2,726,391.29 kg	0.00 kg	2,726,391.29 kg	54,520,361.28 kg
SO2	6,650.05 kg	0.00 kg	6,650.05 kg	132,982.71 kg
NOx	5,722.19 kg	0.00 kg	5,722.19 kg	114,428.16 kg
Total:				
CO2	2,726,391.29 kg	0.00 kg	2,726,391.29 kg	54,520,361.28 kg
SO2	6,650.05 kg	0.00 kg	6,650.05 kg	132,982.71 kg
NOx	5,722.19 kg	0.00 kg	5,722.19 kg	114,428.16 kg

APPENDIX D – AIR QUALITY DATA AND CALCULATIONS

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EMISSIONS SUMMARY

PROJECT ALTERNATIVE	CONSTRUCTION PHASE	TONS PER YEAR, CRITERIA POLLUTANTS						TONS PER YEAR, GHG EMISSIONS			
		ROG	NOx	CO	SOx	PM10	PM2.5	CO2	CH4	N2O	GWP, CO2e
SITE 1	Site Preparation	0.26	2.00	1.31	0.12	1.23	0.54	186.73	0.006	0.004	**188.05**
	Underground Cables	0.01	0.11	0.08	0.00	0.01	0.01	11.32	0.000	0.000	**11.41**
	Array Installation	0.03	0.23	0.19	0.01	0.08	0.03	26.58	0.001	0.001	**26.84**
	Building and Switches	0.00	0.03	0.02	0.00	0.02	0.01	3.47	0.000	0.000	**3.51**
	Construction Worker Commute	0.04	0.03	0.40	0.00	0.00	0.00	19.68	0.000	0.000	**19.68**
	Construction Truck Traffic	0.03	0.42	0.11	0.00	0.01	0.01	100.79	0.000	0.000	**100.79**
	TOTAL	**0.37**	**2.82**	**2.10**	**0.14**	**1.35**	**0.60**	**348.57**	**0.007**	**0.005**	**350.28**
SITE 2	Site Preparation	0.16	1.30	0.83	0.09	1.04	0.44	116.10	0.003	0.002	**116.94**
	Underground Cables	0.01	0.11	0.08	0.00	0.01	0.01	11.10	0.000	0.000	**11.19**
	Array Installation	0.03	0.23	0.19	0.01	0.07	0.03	26.58	0.001	0.001	**26.84**
	Building and Switches	0.00	0.03	0.02	0.00	0.02	0.01	3.47	0.000	0.000	**3.51**
	Construction Worker Commute	0.04	0.03	0.41	0.00	0.00	0.00	20.19	0.000	0.000	**20.19**
	Construction Truck Traffic	0.03	0.41	0.11	0.00	0.01	0.01	98.58	0.000	0.000	**98.59**
	TOTALS	**0.27**	**2.10**	**1.63**	**0.10**	**1.15**	**0.50**	**276.02**	**0.005**	**0.004**	**277.24**

ROG = reactive organic compounds (ozone precursor)
NOx = nitrogen oxides (ozone precursor)
CO = carbon monoxide
SOx = sulfur oxides
PM_{10} = inhalable particulate matter (below 50 microns aerodynamic equivalent diameter); the "10" in PM_{10} is the size with 50% mass collection efficiency in a certified sampler, not an upper particle size limit
$PM_{2.5}$ = fine particulate matter (below 6 microns aerodynamic equivalent diameter); the "2.5" in $PM_{2.5}$ is the size with 50% mass collection efficiency in a certified sampler, not an upper particle size limit

GHG = greenhouse gas
CO_2 = carbon dioxide; GWP multiplier = 1
CH_4 = methane; GWP multiplier = 25
N_2O = nitrous oxide; GWP multiplier = 298
GWP = global warming potential, CO_2 equivalents (CO_2e) from Intergovernmental Panel on Climate Change (IPCC) 2007 fourth assessment report, 100 year time frame

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CONSTRUCTION ACTIVITY EMISSIONS SUMMARY

LAUGHLIN AFB SOLAR PROJECT - PROPOSED ACTION - SITE 1

CONSTRUCTION YEAR: **2011**

EQUIPMENT USE SUMMARY:

PROJECT PHASE	ACTIVITY DURATION, WORKING DAYS	ACREAGE SUBJECT TO DISTURBANCE	TOTAL NUMBER OF EQUIPMENT ITEMS	HOURS OF ON-SITE EQUIPMENT USE	ON-SITE EQUIPMENT FUEL USE, GALLONS	TRUCK TRAFFIC (1-way trips): TRUCK TRIPS TO/ FROM SITE	TRUCK TRAFFIC (1-way trips): TRUCK TRIPS PER DAY
SITE PREPARATION	60	85.0	29	3,376	17,008	197	3.3
UNDERGROUND CABLES	15	2.6	15	311	1,031	132	8.8
ARRAY INSTALLATON	60	29.8	16	1,083	2,421	379	6.3
BUILDING AND SWITCHES	15	0.4	12	73	316	60	4.0
NET WORKING DAYS AND TOTALS:	**120**			**4,843**	**20,776**	**768**	**22**
MINIMUM PHASE:		**0.4**	**12**				**3.3**
MEAN OVER NET WORK PERIOD:		**46.2**	**26**				**6.4**
MAXIMUM PHASE:		**85.0**	**29**				**8.8**

Partially overlapping construction phases.

CONSTRUCTION WORKER TRIP ESTIMATES: **TAB OVER ==> FOR VEHICLE OCCUPANCY CALCS WORK AREA**

PHASE	ON-SITE EQUIP ITEMS	EQUIPMENT OPERATORS	SUPERVISORS	SPECIALTY TRADES	OTHER WORKERS	TOTAL WORKERS	VEHICLE OCCUPANCY	1-WAY VEHICLE TRIPS: TOTAL	1-WAY VEHICLE TRIPS: PER DAY
SITE PREPARATION	15	10	1	0	4	15	1.15	1,565	26
UNDERGROUND CABLES	7	4	1	0	2	7	1.17	179	12
ARRAY INSTALLATON	8	6	2	2	8	18	1.13	1,912	32
BUILDING AND SWITCHES	5	2	1	2	4	9	1.13	239	16
MAX PHASE	**15**					**18**		**1,912**	**32**
TOTAL OR MAX DAILY						**49**		**3,895**	**86**

Partially overlapping construction phases.

On-site equipment equations in Column B read data from the Optional Work Area on the Main Calcs sheet. If Optional Work Area not used, leave Column B alone and manually enter Number of Equipment Operators in Colum
Specialty trades include carpenters, plumbers, electricians, welders, etc. Most likely to be present during utility line installation, building shell construction, and interior finishing type phases.
Base Other Workers on estimated work crew size for nubmer of units or number of acres worked per day.

CALENDAR QUARTER PHASE OVERLAP CALCULATOR: **Total Work Days =** **120**

PHASE	WORK DAYS PER QUARTER Q1	Q2	Q3	Q4
SITE PREPARATION	0	60	0	0
UNDERGROUND CABLES	0	15	0	0
ARRAY INSTALLATON	0	0	60	0
BUILDING AND SWITCHES	0	0	15	0
Available Work Days per Quarter	**61**	**64**	**64**	**64**

POLLUTANT	EMISSIONS BY QUARTER, TONS Q1	Q2	Q3	Q4
ROG	0.00	0.27	0.04	0.00
NOx	0.00	2.11	0.26	0.00
CO	0.00	1.38	0.21	0.00
SOx	0.00	0.13	0.01	0.00
PM_{10}	0.00	1.24	0.09	0.00

	5-day week	6-day week	7-day week
Q1	61	75	88
Q2	64	77	89
Q3	64	77	90
Q4	65	77	89
AVERAGE	63.5	76.5	89
SUM	254	306	356

Note: Analysis assumes a 5-day work week with allowances for major holidays.
Calendar quarters used in an absolute sense. Construction expected to start in January 2006.

ARCHIVED EQUATIONS FOR CALENDAR QUARTER PHASE OVERLAP CALCULATOR: **Total Work Days =** **0**

ignore displayed values of equations below and simply copy them back as necessary to the Calculator section abov

61	64	64	65

PHASE	Q1	Q2	Q3	Q4
SITE PREPARATION	0	0	0	0
UNDERGROUND CABLES		0	0	0
ARRAY INSTALLATON		0	0	0
BUILDING AND SWITCHES	0	0	0	0

	5-day week	6-day week	7-day week
Q1	61	75	88
Q2	64	77	89
Q3	64	77	90
Q4	65	77	89
AVERAGE	63.5	76.5	89
SUM	254	306	356

SEASONAL VARIATION IN NATURAL CONTROL OF FUGITIVE DUST Del Rio Airport, 1951-2007 data

PARAMETER	QUARTER 1	QUARTER 2	QUARTER 3	QUARTER 4	ANNUAL
Percent Days with Meaningful Precipitation	16.7%	18.7%	15.2%	15.2%	16.4%
Percent Days with Frozen Ground or Snow	0.0%	0.0%	0.0%	0.0%	0.0%
Control Factor for Natural Soil Moisture	0.0%	0.0%	0.0%	0.0%	0.0%
DAILY NATURAL CONTROL	0.0%	0.0%	0.0%	0.0%	
QUARTERLY NATURAL CONTROL	16.7%	18.7%	15.2%	15.2%	16.4%
Days per Calendar Quarter	90	91	92	92	365

Precipitation control is typically the % days with more than 0.01" of precipitation (this assumes that counting low precipitation days compensates for high precipitation days that control fugitive dust for multiple days). A higher precipitation threshold may be appropriate in hot desert areas.
Precipitation threhsold of 0.01 inches used for all quarters.
The entry for natural soil moisture conditions is an overall % emissions control, not % of days affected by this condition (seeps, perched water table, etc.).
Daily contorl of fugituve dust from soil disturbance is influenced only by control from natural soil moisture levels, unless either % days with precipitation or % days with frozen ground or snow cover is 100% of days in a calendar quarter.
Quarterly natural control is either control by natural soil moisture or by the sum of % days with precipitation, frozen ground, and snow, whichever is greater.
Natural dust control factors are applied to the residual fugitive dust remaining after active dust controls. For a conservative analysis, use 0% for all entries.

CRITERIA POLLUTANT EMISSIONS, TYPICAL CONSTRUCTION DAY: **2011**

PROJECT PHASE	COMPONENT	DAILY EMISSIONS, POUNDS PER DAY						
		ROG	NOx	CO	SOx	PM_{10}	$PM_{2.5}$	DPM
SITE PREPARATION	Equipment	8.67	66.80	43.51	4.13	6.41	5.89	6.41
	Fugitive Dust	0.00	0.00	0.00	0.00	42.50	14.88	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**8.67**	**66.80**	**43.51**	**4.13**	**48.91**	**20.77**	**6.41**
UNDERGROUND CABLES	Equipment	1.84	14.32	10.63	0.45	0.91	0.84	0.91
	Fugitive Dust	0.00	0.00	0.00	0.00	0.85	0.30	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**1.84**	**14.32**	**10.63**	**0.45**	**1.76**	**1.14**	**0.91**
ARRAY INSTALLATON	Equipment	1.07	7.67	6.25	0.21	0.46	0.42	0.46
	Fugitive Dust	0.00	0.00	0.00	0.00	2.50	0.88	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**1.07**	**7.67**	**6.25**	**0.21**	**2.96**	**1.29**	**0.46**
BUILDING AND SWITCHES	Equipment	0.46	4.30	2.92	0.19	0.30	0.28	0.30
	Fugitive Dust	0.00	0.00	0.00	0.00	2.07	0.72	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.46**	**4.30**	**2.92**	**0.19**	**2.37**	**1.00**	**0.30**
TOTALS	**Equipment**	**12.05**	**93.09**	**63.30**	**4.99**	**8.08**	**7.43**	**8.08**
	Fugitive Dust	**0.00**	**0.00**	**0.00**	**0.00**	**47.92**	**16.77**	**0.00**
	Fugitive ROG	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	TOTAL	**12.05**	**93.09**	**63.30**	**4.99**	**56.00**	**24.20**	**8.08**
MAXIMUM DAY	**Equipment**	**10.52**	**81.13**	**54.14**	**4.58**	**7.32**	**6.73**	**7.32**
	Fugitive Dust	**0.00**	**0.00**	**0.00**	**0.00**	**43.35**	**15.17**	**0.00**
	Fugitive ROG	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	TOTAL	**10.52**	**81.13**	**54.14**	**4.58**	**50.67**	**21.91**	**7.32**

Totals apply only if phase durations or subarea sequencings require all phases to overlap at some point during the construction period.
Partially overlapping construction phases.
Maximum day estimates made on a pollutant-by-pollutant basis, accounting for expected overlaps among construction phases.
ROG = reactive organic compounds (ozone precursor)
NOx = nitrogen oxides (ozone precursor)
CO = carbon monoxide
SOx = sulfur oxides
PM_{10} = inhalable particulate matter (below 50 microns aerodynamic equivalent diameter); the "10" in PM_{10} is the size with 50% mass collection efficiency in a certified sampler, not an upper particle size limit
$PM_{2.5}$ = fine particulate matter (below 6 microns aerodynamic equivalent diameter); the "2.5" in $PM_{2.5}$ is the size with 50% mass collection efficiency in a certified sampler, not an upper particle size limit
DPM = diesel particulate matter (carcinogen)

CRITERIA POLLUTANT EMISSIONS FOR CONSTRUCTION YEAR: 2011

PROJECT PHASE	COMPONENT	TOTAL EMISSIONS, TONS PER YEAR						
		ROG	NOx	CO	SOx	PM_{10}	$PM_{2.5}$	DPM
SITE PREPARATION	Equipment	0.26	2.00	1.31	0.12	0.19	0.18	0.19
	Fugitive Dust	0.00	0.00	0.00	0.00	1.04	0.36	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.26**	**2.00**	**1.31**	**0.12**	**1.23**	**0.54**	**0.19**
UNDERGROUND CABLES	Equipment	0.01	0.11	0.08	0.00	0.01	0.01	0.01
	Fugitive Dust	0.00	0.00	0.00	0.00	0.01	0.00	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.01**	**0.11**	**0.08**	**0.00**	**0.01**	**0.01**	**0.01**
ARRAY INSTALLATON	Equipment	0.03	0.23	0.19	0.01	0.01	0.01	0.01
	Fugitive Dust	0.00	0.00	0.00	0.00	0.06	0.02	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.03**	**0.23**	**0.19**	**0.01**	**0.08**	**0.03**	**0.01**
BUILDING AND SWITCHES	Equipment	0.00	0.03	0.02	0.00	0.00	0.00	0.00
	Fugitive Dust	0.00	0.00	0.00	0.00	0.01	0.00	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.03**	**0.02**	**0.00**	**0.02**	**0.01**	**0.00**
TOTALS	**Equipment**	**0.31**	**2.37**	**1.59**	**0.14**	**0.22**	**0.20**	**0.22**
	Fugitive Dust	**0.00**	**0.00**	**0.00**	**0.00**	**1.12**	**0.39**	**0.00**
	Fugitive ROG	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	TOTAL	**0.31**	**2.37**	**1.59**	**0.14**	**1.33**	**0.59**	**0.22**
MAX CALENDAR QUARTER	**Equipment**	**0.27**	**2.11**	**1.38**	**0.13**	**0.20**	**0.18**	**0.20**
	Fugitive Dust	**0.00**	**0.00**	**0.00**	**0.00**	**1.04**	**0.45**	**0.00**
	Fugitive ROG	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	TOTAL	**0.27**	**2.11**	**1.38**	**0.13**	**1.24**	**0.63**	**0.20**

Maximum calendar quarter estimates made on a pollutant-by-pollutant basis, accounting for expected overlaps among construction phases.
ROG = reactive organic compounds (ozone precursor)
NOx = nitrogen oxides (ozone precursor)
CO = carbon monoxide
SOx = sulfur oxides
PM_{10} = inhalable particulate matter (below 50 microns aerodynamic equivalent diameter); the "10" in PM_{10} is the size with 50% mass collection efficiency in a certified sampler, not an upper particle size limit
$PM_{2.5}$ = fine particulate matter (below 6 microns aerodynamic equivalent diameter); the "2.5" in $PM_{2.5}$ is the size with 50% mass collection efficiency in a certified sampler, not an upper particle size limit
DPM = diesel particulate matter (carcinogen)

FUGITIVE EMISSIONS DETAILS BY PHASE:

PARAMETER	PHASE 1	PHASE 2	PHASE 3	PHASE 4
Assumed Soil Texture Class	sandy loam	sandy loam	sandy loam	sandy loam
Soil PM_{10} Fraction	25.0%	25.0%	25.0%	25.0%
Active Dust Control Program Effectiveness	50%	50%	50%	50%
Natural Dust Control, Daily Basis	0.0%	0.0%	0.0%	0.0%
Natural Dust Control, Annual Basis	18.7%	18.7%	15.2%	15.2%
Area Disturbed on a Typical Day, acres	4.25	0.17	0.50	0.41
Days of Disturbance	60	15	60	15
Uncontrolled TSP Rate, lbs/acre-day	80.0	40.0	40.0	40.0
Controlled PM_{10} Rate, lbs/acre-day	10.0	5.0	5.0	5.0
Demolition PM_{10}, total pounds	0.0	0.0	0.0	0.0
Construction Blasting PM_{10}, total pounds	0.0	0.0	0.0	0.0
Acres of asphalt paving	0.00	0.00	0.00	0.00
Painted Surface Area, square feet	0	0	0	0
$PM_{2.5}$ fraction of engine exhaust PM_{10}	92.0%	92.0%	92.0%	92.0%
$PM_{2.5}$ fraction of fugitive dust PM_{10}	35.0%	35.0%	35.0%	35.0%
$PM_{2.5}$ fraction of spray paint PM_{10}	91.2%	91.2%	91.2%	91.2%

$PM_{2.5}$ fractions of diesel engine exhaust PM_{10} and spray paint PM_{10} are based on data from the California Air Resources Board CEIDA (California Emission Inventory Data and Reporting System) database, as presented in Appendix A of SCAQMD 2003, Final Methodology to Calculate $PM_{2.5}$ and $PM_{2.5}$ Significance Thresholds.
$PM_{2.5}$ fraction of fugitive dust PM_{10} based on typical clay and fine silt content for soils texture class.
Natural dust control factors are applied to the residual fugitive dust remaining after active dust controls.
$PM_{2.5}$ fractions from the CARB CEIDARS database are 92% to 97.6% for diesel vehicle exhaust, 20.8% to 57.8% for construction site dust, and 91.2% to 96.4% for spray painting. See the FUGITIVE DUST DATABASE worksheet for details.

GLOBAL WARMING POTENTIAL DATA SET SELECTION:

DATA SOURCE	DATA SET CODE	GWP FOR CH_4	GWP FOR N_2O
IPCC 2nd Assessment, 1995:	1	21	310
IPCC 3rd Assessment, 2001:	2	23	296
IPCC 4th Assessment, 2007:	3	25	298

SELECTED GWP DATA SET (1, 2, or 3) =	3
CH_4 factor:	25
N_2O factor:	298

GREENHOUSE GAS EMISSIONS SUMMARY: 2011

PROJECT PHASE	AVERAGE DAILY GHG EMISSIONS, POUNDS PER DAY			
	CO_2	CH_4	N_2O	GWP, CO_2e
SITE PREPARATION	6,224.4	0.18	0.13	**6,268.2**
UNDERGROUND CABLES	1,509.0	0.05	0.04	**1,521.8**
ARRAY INSTALLATON	885.9	0.04	0.03	**894.5**
BUILDING AND SWITCHES	463.1	0.02	0.01	**468.1**
MAXIMUM DAY:	**7,733.4**	**0.24**	**0.17**	**7,790.1**

Metric tons per short ton = 0.907184749

NOTE: In the case of GHG emissions, the interest is in total GWP as CO2e, not the values of individual GWP pollutants. Set maximum day equation based on construction phase GWP values, not pollutant-by-pollutant values. Equations should reflect whether construction phases can overlap or not.

PROJECT PHASE	TOTAL GHG EMISSIONS, TONS PER YEAR				TOTAL GHG EMISSIONS, METRIC TONS PER YEAR			
	CO_2	CH_4	N_2O	GWP, CO_2e	CO_2	CH_4	N_2O	GWP, CO_2e
SITE PREPARATION	186.7	0.006	0.004	**188.0**	169.4	0.005	0.004	**170.6**
UNDERGROUND CABLES	11.3	0.000	0.000	**11.4**	10.3	0.000	0.000	**10.4**
ARRAY INSTALLATON	26.6	0.001	0.001	**26.8**	24.1	0.001	0.001	**24.3**
BUILDING AND SWITCHES	3.5	0.000	0.000	**3.5**	3.2	0.000	0.000	**3.2**
MAXIMUM QUARTER:	**198.0**	**0.006**	**0.004**	**199.5**	**179.7**	**0.005**	**0.004**	**180.9**
CONSTRUCTION PERIOD TOTALS:	**228.1**	**0.007**	**0.005**	**229.8**	**206.9**	**0.007**	**0.005**	**208.5**

GHG = greenhouse gas
CO_2 = carbon dioxide; GWP multiplier = 1
CH_4 = methane; GWP multiplier = 25
N_2O = nitrous oxide; GWP multiplier = 298
GWP = global warming potential, CO_2 equivalents (CO_2e) from Intergovernmental Panel on Climate Change (IPCC) 2007 fourth assessment report, 100 year time frame
Maximum day estimates based on expected overlaps among construction phases.

FORMATTED FOOTNOTE SETS:

GWP Data Set 1 footnotes:

CH_4 = methane; GWP multiplier = 21

N_2O = nitrous oxide; GWP multiplier = 310

GWP = global warming potential, CO_2 equivalents (CO_2e) from Intergovernmental Panel on Climate Change (IPCC) 1995 second assessment report, 100 year time frame

GWP Data Set 2 footnotes:

CH_4 = methane; GWP multiplier = 23

N_2O = nitrous oxide; GWP multiplier = 296

GWP = global warming potential, CO_2 equivalents (CO_2e) from Intergovernmental Panel on Climate Change (IPCC) 2001 third assessment report, 100 year time frame

GWP Data Set 3 footnotes:

CH_4 = methane; GWP multiplier = 25

N_2O = nitrous oxide; GWP multiplier = 298

GWP = global warming potential, CO_2 equivalents (CO_2e) from Intergovernmental Panel on Climate Change (IPCC) 2007 fourth assessment report, 100 year time frame

CALENDAR QUARTER CRITERIA POLLUTANT EMISSIONS: 2011

CALENDAR QUARTER	COMPONENT	CRITERIA POLLUTANT EMISSIONS, TONS BY CALENDAR QUARTER						
		ROG	NOx	CO	SOx	PM_{10}	$PM_{2.5}$	DPM
QUARTER 1	Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Fugitive Dust	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
QUARTER 2	Equipment	0.27	2.11	1.38	0.13	0.20	0.18	0.20
	Fugitive Dust	0.00	0.00	0.00	0.00	1.04	0.45	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.27**	**2.11**	**1.38**	**0.13**	**1.24**	**0.63**	**0.20**
QUARTER 3	Equipment	0.04	0.26	0.21	0.01	0.02	0.01	0.02
	Fugitive Dust	0.00	0.00	0.00	0.00	0.08	0.03	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.04**	**0.26**	**0.21**	**0.01**	**0.09**	**0.05**	**0.02**
QUARTER 4	Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Fugitive Dust	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
MAXIMUM QUARTER	**Equipment**	**0.27**	**2.11**	**1.38**	**0.13**	**0.20**	**0.18**	**0.20**
	Fugitive Dust	**0.00**	**0.00**	**0.00**	**0.00**	**1.04**	**0.45**	**0.00**
	Fugitive ROG	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	TOTAL	**0.27**	**2.11**	**1.38**	**0.13**	**1.24**	**0.63**	**0.20**

ROG = reactive organic compounds (ozone precursor)
NOx = nitrogen oxides (ozone precursor)
CO = carbon monoxide
SOx = sulfur oxides
PM_{10} = inhalable particulate matter (below 50 microns aerodynamic equivalent diameter); the "10" in PM_{10} is the size with 50% mass collection efficiency in a certified sampler, not an upper particle size limit
$PM_{2.5}$ = fine particulate matter (below 6 microns aerodynamic equivalent diameter); the "2.5" in $PM_{2.5}$ is the size with 50% mass collection efficiency in a certified sampler, not an upper particle size limit
DPM = diesel particulate matter (carcinogen)

Metric tons per short ton = 0.907184749

CALENDAR QUARTER GHG EMISSIONS: 2011

CALENDAR QUARTER	GHG EMISSIONS, TONS BY CALENDAR QUARTER				GHG EMISSIONS, METRIC TONS BY CALENDAR QUARTER			
	CO_2	CH_4	N_2O	GWP, CO_2e	CO_2	CH_4	N_2O	GWP, CO_2e
QUARTER 1	0.0	0.000	0.000	**0.0**	0.0	0.000	0.000	**0.0**
QUARTER 2	198.0	0.006	0.004	**199.5**	179.7	0.005	0.004	**180.9**
QUARTER 3	30.1	0.001	0.001	**30.3**	27.3	0.001	0.001	**27.5**
QUARTER 4	0.0	0.000	0.000	**0.0**	0.0	0.000	0.000	**0.0**
MAXIMUM QUARTER	**198.0**	**0.006**	**0.004**	**199.5**	**179.7**	**0.005**	**0.004**	**180.9**

GHG = greenhouse gas
CO_2 = carbon dioxide; GWP multiplier = 1
CH_4 = methane; GWP multiplier = 25
N_2O = nitrous oxide; GWP multiplier = 298
GWP = global warming potential, CO_2 equivalents (CO_2e) from Intergovernmental Panel on Climate Change (IPCC) 2007 fourth assessment report, 100 year time frame

NATURAL CONTROL OF DAILY FUGITIVE DUST BY PHASE

CALENDAR QUARTER	PHASE 1	PHASE 2	PHASE 3	PHASE 4
QUARTER 1	0.0%	0.0%	0.0%	0.0%
QUARTER 2	0.0%	0.0%	0.0%	0.0%
QUARTER 3	0.0%	0.0%	0.0%	0.0%
QUARTER 4	0.0%	0.0%	0.0%	0.0%
DAILY AVERAGE BY PHASE	**0.0%**	**0.0%**	**0.0%**	**0.0%**

NATURAL CONTROL OF DAILY FUGITIVE DUST BY PHASE

CALENDAR QUARTER	PHASE 1	PHASE 2	PHASE 3	PHASE 4
QUARTER 1	0.0%	0.0%	0.0%	0.0%
QUARTER 2	0.0%	0.0%	0.0%	0.0%
QUARTER 3	0.0%	0.0%	0.0%	0.0%
QUARTER 4	0.0%	0.0%	0.0%	0.0%
DAILY AVERAGE BY PHASE	**0.0%**	**0.0%**	**0.0%**	**0.0%**

NATURAL CONTROL OF ANNUAL FUGITIVE DUST BY PHASE

CALENDAR QUARTER	PHASE 1	PHASE 2	PHASE 3	PHASE 4
QUARTER 1	0.0%	0.0%	0.0%	0.0%
QUARTER 2	18.7%	18.7%	0.0%	0.0%
QUARTER 3	0.0%	0.0%	15.2%	15.2%
QUARTER 4	0.0%	0.0%	0.0%	0.0%
ANNUAL AVERAGE BY PHASE	**18.7%**	**18.7%**	**15.2%**	**15.2%**

EQUIPMENT USE DETAILS, PHASE 1: SITE PREPARATION

EQUIPMENT ITEM	ENGINE HP	LOAD FACTOR	OPERATING FACTOR	NUMBER OF ITEMS	HOURS PER DAY	FUEL USE RATE, gal/hr
Small Tracked Brush Cutter, 25 - 75 HP	55	52%	85%	3	6	1.94
Medium Tracked Dozer, 175 - 750 HP	250	59%	85%	5	6	7.70
Medium Motor Grader, 75 - 175 HP	150	54%	85%	1	2	4.23
Small Wheeled Loader, 75 - 175 HP	125	54%	75%	1	4	3.52
Medium Standard Roller/Compactor, 75 - 175 HP	100	59%	85%	1	4	3.08
Medium Chippers & Stump Grinders, 25 - 75 HP	40	37%	65%	1	4	0.86
Small Wheeled Tractor, 25 - 75 HP	70	38%	85%	1	2	1.80
Medium Trencher, 75 -175 HP	100	64%	85%	0	0	3.34
Small Tracked Cable Plow, 75 - 175 HP	80	57%	85%	0	0	3.09
Small Wheeled Backhoe-Loader, 25 - 75 HP	70	38%	85%	0	0	1.80
Medium Rough Terrain Forklift, 75 - 175 HP	100	35%	65%	0	0	1.83
Small Line Pullers, 25 - 50 HP	44	75%	75%	0	0	1.91
Small Excavator-Mounted Auger, 25 - 75 HP	60	59%	45%	0	0	2.05
Portable Cement/Mortar Mixer, < 25 HP	11	56%	90%	0	0	0.36
Small Wheeled Dozer, 75 - 175 HP	150	59%	85%	0	0	4.62
Small Mobile Crane, 75 - 175 HP	125	43%	75%	0	0	2.81
Medium (2,000 gal) Water Truck, 175 - 750 HP	250	57%	65%	2	2	7.44
Medium Equipment Transporter, 175 - 750 HP	300	57%	25%	11	0	8.92
10-Ton (7-10 yd) Dump Truck, 175 - 750 HP	300	57%	25%	1	0	8.92
20-Ton (15-20 yd) Dump Truck, 175 - 750 HP	400	57%	25%	1	1	11.90
Medium Flatbed Truck, 175 - 750 HP	300	57%	25%	0	0	8.92
Medium (7-9 Yard) Cement Mixer Truck	325	57%	40%	0	0	9.67
Medium (2,000 gallon) Fuel Truck, 175 - 750 HP	250	57%	65%	1	0	7.44
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00

Heavy truck hourly operating factor reflects on-site and immediate vicinity use only.

Proposed Action Site 1

Emission rates reflect engine HP and load factor; operating time factor is accounted for separately in net engine-hours calculations.

CRITERIA POLLUTANT EMISSION RATE, GRAMS/HOUR					GHG EMISSION RATE, LBS/HOUR		
ROG	NOx	CO	SOx	PM10	CO_2	CH_4	N_2O
28.60	131.41	105.82	0.27	4.58	42.57	0.0012	0.0009
113.37	888.48	567.38	63.15	94.89	169.04	0.0048	0.0034
89.97	544.75	303.59	28.50	41.34	92.83	0.0039	0.0028
37.02	434.98	275.74	14.83	30.11	77.36	0.0033	0.0023
32.22	358.86	205.91	15.07	20.30	67.62	0.0010	0.0007
12.03	78.25	62.46	0.84	3.32	18.86	0.0003	0.0002
25.62	179.07	127.28	5.78	10.59	39.60	0.0011	0.0008
49.64	313.20	283.22	3.61	14.34	73.35	0.0010	0.0007
39.03	306.93	186.28	9.90	18.70	67.88	0.0019	0.0014
25.62	179.07	127.28	5.78	10.59	39.60	0.0011	0.0008
33.86	155.80	158.90	1.97	7.84	40.11	0.0017	0.0012
30.19	196.85	145.70	7.84	12.80	42.04	0.0006	0.0004
14.16	212.04	138.06	2.00	7.93	45.10	0.0006	0.0005
3.02	31.60	30.18	0.06	0.99	7.85	0.0001	0.0001
55.15	607.72	289.22	33.28	34.34	101.43	0.0029	0.0020
34.82	269.91	202.46	3.03	12.04	61.60	0.0004	0.0003
48.76	520.00	380.48	32.40	49.59	163.31	0.0057	0.0041
58.42	623.01	456.57	38.88	59.51	195.97	0.0165	0.0118
58.42	623.01	456.57	38.88	59.51	195.97	0.0165	0.0118
77.89	830.69	608.76	51.85	79.34	261.30	0.0220	0.0157
58.42	623.01	456.57	38.88	59.51	195.97	0.0165	0.0118
63.29	674.93	494.62	42.12	64.47	212.31	0.0179	0.0128
48.76	520.00	380.48	32.40	49.59	163.31	0.0057	0.0041
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000

EQUIPMENT USE DETAILS, PHASE 2: UNDERGROUND CABLES

EQUIPMENT ITEM	ENGINE HP	LOAD FACTOR	OPERATING FACTOR	NUMBER OF ITEMS	HOURS PER DAY	FUEL USE RATE, gal/hr
Small Tracked Brush Cutter, 25 - 75 HP	55	52%	85%	0	0	1.94
Medium Tracked Dozer, 175 - 750 HP	250	59%	85%	0	0	7.70
Medium Motor Grader, 75 - 175 HP	150	54%	85%	0	0	4.23
Small Wheeled Loader, 75 - 175 HP	125	54%	75%	1	4	3.52
Medium Standard Roller/Compactor, 75 - 175 HP	100	59%	85%	0	0	3.08
Medium Chippers & Stump Grinders, 25 - 75 HP	40	37%	65%	0	0	0.86
Small Wheeled Tractor, 25 - 75 HP	70	38%	85%	0	0	1.80
Medium Trencher, 75 -175 HP	100	64%	85%	1	6	3.34
Small Tracked Cable Plow, 75 - 175 HP	80	57%	85%	1	6	3.09
Small Wheeled Backhoe-Loader, 25 - 75 HP	70	38%	85%	1	2	1.80
Medium Rough Terrain Forklift, 75 - 175 HP	100	35%	65%	1	4	1.83
Small Line Pullers, 25 - 50 HP	44	75%	75%	1	2	1.91
Small Excavator-Mounted Auger, 25 - 75 HP	60	59%	45%	0	0	2.05
Portable Cement/Mortar Mixer, < 25 HP	11	56%	90%	0	0	0.36
Small Wheeled Dozer, 75 - 175 HP	150	59%	85%	0	0	4.62
Small Mobile Crane, 75 - 175 HP	125	43%	75%	0	0	2.81
Medium (2,000 gal) Water Truck, 175 - 750 HP	250	57%	65%	1	1	7.44
Medium Equipment Transporter, 175 - 750 HP	300	57%	25%	4	0.134	8.92
10-Ton (7-10 yd) Dump Truck, 175 - 750 HP	300	57%	25%	3	1.2	8.92
20-Ton (15-20 yd) Dump Truck, 175 - 750 HP	400	57%	25%	0	0	11.90
Medium Flatbed Truck, 175 - 750 HP	300	57%	25%	1	0.27	8.92
Medium (7-9 Yard) Cement Mixer Truck	325	57%	40%	0	0	9.67
Medium (2,000 gallon) Fuel Truck, 175 - 750 HP	250	57%	65%	0	0	7.44
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00

Heavy truck hourly operating factor reflects on-site and immediate vicinity use only.

Proposed Action Site 1

CRITERIA POLLUTANT EMISSION RATE, GRAMS/HOUR					GHG EMISSION RATE, LBS/HOUR		
ROG	**NOx**	**CO**	**SOx**	**PM10**	**CO_2**	**CH_4**	**N_2O**
28.60	131.41	105.82	0.27	4.58	42.57	0.0012	0.0009
113.37	888.48	567.38	63.15	94.89	169.04	0.0048	0.0034
89.97	544.75	303.59	28.50	41.34	92.83	0.0039	0.0028
37.02	434.98	275.74	14.83	30.11	77.36	0.0033	0.0023
32.22	358.86	205.91	15.07	20.30	67.62	0.0010	0.0007
12.03	78.25	62.46	0.84	3.32	18.86	0.0003	0.0002
25.62	179.07	127.28	5.78	10.59	39.60	0.0011	0.0008
49.64	313.20	283.22	3.61	14.34	73.35	0.0010	0.0007
39.03	306.93	186.28	9.90	18.70	67.88	0.0019	0.0014
25.62	179.07	127.28	5.78	10.59	39.60	0.0011	0.0008
33.86	155.80	158.90	1.97	7.84	40.11	0.0017	0.0012
30.19	196.85	145.70	7.84	12.80	42.04	0.0006	0.0004
14.16	212.04	138.06	2.00	7.93	45.10	0.0006	0.0005
3.02	31.60	30.18	0.06	0.99	7.85	0.0001	0.0001
55.15	607.72	289.22	33.28	34.34	101.43	0.0029	0.0020
34.82	269.91	202.46	3.03	12.04	61.60	0.0004	0.0003
48.76	520.00	380.48	32.40	49.59	163.31	0.0057	0.0041
58.42	623.01	456.57	38.88	59.51	195.97	0.0165	0.0118
58.42	623.01	456.57	38.88	59.51	195.97	0.0165	0.0118
77.89	830.69	608.76	51.85	79.34	261.30	0.0220	0.0157
58.42	623.01	456.57	38.88	59.51	195.97	0.0165	0.0118
63.29	674.93	494.62	42.12	64.47	212.31	0.0179	0.0128
48.76	520.00	380.48	32.40	49.59	163.31	0.0057	0.0041
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000

Emission rates reflect engine HP and load factor; operating time factor is accounted for separately in net engine-hours calculations.

EQUIPMENT USE DETAILS, PHASE 3: ARRAY INSTALLATON

EQUIPMENT ITEM	ENGINE HP	LOAD FACTOR	OPERATING FACTOR	NUMBER OF ITEMS	HOURS PER DAY	FUEL USE RATE, gal/hr
Small Tracked Brush Cutter, 25 - 75 HP	55	52%	85%	0	0	1.94
Medium Tracked Dozer, 175 - 750 HP	250	59%	85%	0	0	7.70
Medium Motor Grader, 75 - 175 HP	150	54%	85%	0	0	4.23
Small Wheeled Loader, 75 - 175 HP	125	54%	75%	0	0	3.52
Medium Standard Roller/Compactor, 75 - 175 HP	100	59%	85%	0	0	3.08
Medium Chippers & Stump Grinders, 25 - 75 HP	40	37%	65%	0	0	0.86
Small Wheeled Tractor, 25 - 75 HP	70	38%	85%	1	4	1.80
Medium Trencher, 75 -175 HP	100	64%	85%	0	0	3.34
Small Tracked Cable Plow, 75 - 175 HP	80	57%	85%	0	0	3.09
Small Wheeled Backhoe-Loader, 25 - 75 HP	70	38%	85%	0	0	1.80
Medium Rough Terrain Forklift, 75 - 175 HP	100	35%	65%	3	4	1.83
Small Line Pullers, 25 - 50 HP	44	75%	75%	0	0	1.91
Small Excavator-Mounted Auger, 25 - 75 HP	60	59%	45%	2	4	2.05
Portable Cement/Mortar Mixer, < 25 HP	11	56%	90%	1	2	0.36
Small Wheeled Dozer, 75 - 175 HP	150	59%	85%	0	0	4.62
Small Mobile Crane, 75 - 175 HP	125	43%	75%	0	0	2.81
Medium (2,000 gal) Water Truck, 175 - 750 HP	250	57%	65%	1	1	7.44
Medium Equipment Transporter, 175 - 750 HP	300	57%	25%	4	0	8.92
10-Ton (7-10 yd) Dump Truck, 175 - 750 HP	300	57%	25%	0	0	8.92
20-Ton (15-20 yd) Dump Truck, 175 - 750 HP	400	57%	25%	0	0	11.90
Medium Flatbed Truck, 175 - 750 HP	300	57%	25%	3	1	8.92
Medium (7-9 Yard) Cement Mixer Truck	325	57%	40%	0	0	9.67
Medium (2,000 gallon) Fuel Truck, 175 - 750 HP	250	57%	65%	1	0	7.44
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00

Heavy truck hourly operating factor reflects on-site and immediate vicinity use only.

Proposed Action Site 1

CRITERIA POLLUTANT EMISSION RATE, GRAMS/HOUR					GHG EMISSION RATE, LBS/HOUR		
ROG	**NOx**	**CO**	**SOx**	**PM10**	**CO_2**	**CH_4**	**N_2O**
28.60	131.41	105.82	0.27	4.58	42.57	0.0012	0.0009
113.37	888.48	567.38	63.15	94.89	169.04	0.0048	0.0034
89.97	544.75	303.59	28.50	41.34	92.83	0.0039	0.0028
37.02	434.98	275.74	14.83	30.11	77.36	0.0033	0.0023
32.22	358.86	205.91	15.07	20.30	67.62	0.0010	0.0007
12.03	78.25	62.46	0.84	3.32	18.86	0.0003	0.0002
25.62	179.07	127.28	5.78	10.59	39.60	0.0011	0.0008
49.64	313.20	283.22	3.61	14.34	73.35	0.0010	0.0007
39.03	306.93	186.28	9.90	18.70	67.88	0.0019	0.0014
25.62	179.07	127.28	5.78	10.59	39.60	0.0011	0.0008
33.86	155.80	158.90	1.97	7.84	40.11	0.0017	0.0012
30.19	196.85	145.70	7.84	12.80	42.04	0.0006	0.0004
14.16	212.04	138.06	2.00	7.93	45.10	0.0006	0.0005
3.02	31.60	30.18	0.06	0.99	7.85	0.0001	0.0001
55.15	607.72	289.22	33.28	34.34	101.43	0.0029	0.0020
34.82	269.91	202.46	3.03	12.04	61.60	0.0004	0.0003
48.76	520.00	380.48	32.40	49.59	163.31	0.0057	0.0041
58.42	623.01	456.57	38.88	59.51	195.97	0.0165	0.0118
58.42	623.01	456.57	38.88	59.51	195.97	0.0165	0.0118
77.89	830.69	608.76	51.85	79.34	261.30	0.0220	0.0157
58.42	623.01	456.57	38.88	59.51	195.97	0.0165	0.0118
63.29	674.93	494.62	42.12	64.47	212.31	0.0179	0.0128
48.76	520.00	380.48	32.40	49.59	163.31	0.0057	0.0041
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000

Emission rates reflect engine HP and load factor; operating time factor is accounted for separately in net engine-hours calculations.

EQUIPMENT USE DETAILS, PHASE 4: BUILDING AND SWITCHES

EQUIPMENT ITEM	ENGINE HP	LOAD FACTOR	OPERATING FACTOR	NUMBER OF ITEMS	HOURS PER DAY	FUEL USE RATE, gal/hr
Small Tracked Brush Cutter, 25 - 75 HP	55	52%	85%	0	0	1.94
Medium Tracked Dozer, 175 - 750 HP	250	59%	85%	0	0	7.70
Medium Motor Grader, 75 - 175 HP	150	54%	85%	0	0	4.23
Small Wheeled Loader, 75 - 175 HP	125	54%	75%	1	1	3.52
Medium Standard Roller/Compactor, 75 - 175 HP	100	59%	85%	0	0	3.08
Medium Chippers & Stump Grinders, 25 - 75 HP	40	37%	65%	0	0	0.86
Small Wheeled Tractor, 25 - 75 HP	70	38%	85%	0	0	1.80
Medium Trencher, 75 -175 HP	100	64%	85%	0	0	3.34
Small Tracked Cable Plow, 75 - 175 HP	80	57%	85%	0	0	3.09
Small Wheeled Backhoe-Loader, 25 - 75 HP	70	38%	85%	0	0	1.80
Medium Rough Terrain Forklift, 75 - 175 HP	100	35%	65%	1	2	1.83
Small Line Pullers, 25 - 50 HP	44	75%	75%	0	0	1.91
Small Excavator-Mounted Auger, 25 - 75 HP	60	59%	45%	0	0	2.05
Portable Cement/Mortar Mixer, < 25 HP	11	56%	90%	0	0	0.36
Small Wheeled Dozer, 75 - 175 HP	150	59%	85%	1	1	4.62
Small Mobile Crane, 75 - 175 HP	125	43%	75%	1	1	2.81
Medium (2,000 gal) Water Truck, 175 - 750 HP	250	57%	65%	1	1	7.44
Medium Equipment Transporter, 175 - 750 HP	300	57%	25%	4	0.13	8.92
10-Ton (7-10 yd) Dump Truck, 175 - 750 HP	300	57%	25%	1	0.6	8.92
20-Ton (15-20 yd) Dump Truck, 175 - 750 HP	400	57%	25%	0	0	11.90
Medium Flatbed Truck, 175 - 750 HP	300	57%	25%	1	0.4	8.92
Medium (7-9 Yard) Cement Mixer Truck	325	57%	40%	1	0.47	9.67
Medium (2,000 gallon) Fuel Truck, 175 - 750 HP	250	57%	65%	0	0	7.44
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00

Heavy truck hourly operating factor reflects on-site and immediate vicinity use only.

CRITERIA POLLUTANT EMISSION RATE, GRAMS/HOUR					GHG EMISSION RATE, LBS/HOUR		
ROG	**NOx**	**CO**	**SOx**	**PM10**	**CO_2**	**CH_4**	**N_2O**
28.60	131.41	105.82	0.27	4.58	42.57	0.0012	0.0009
113.37	888.48	567.38	63.15	94.89	169.04	0.0048	0.0034
89.97	544.75	303.59	28.50	41.34	92.83	0.0039	0.0028
37.02	434.98	275.74	14.83	30.11	77.36	0.0033	0.0023
32.22	358.86	205.91	15.07	20.30	67.62	0.0010	0.0007
12.03	78.25	62.46	0.84	3.32	18.86	0.0003	0.0002
25.62	179.07	127.28	5.78	10.59	39.60	0.0011	0.0008
49.64	313.20	283.22	3.61	14.34	73.35	0.0010	0.0007
39.03	306.93	186.28	9.90	18.70	67.88	0.0019	0.0014
25.62	179.07	127.28	5.78	10.59	39.60	0.0011	0.0008
33.86	155.80	158.90	1.97	7.84	40.11	0.0017	0.0012
30.19	196.85	145.70	7.84	12.80	42.04	0.0006	0.0004
14.16	212.04	138.06	2.00	7.93	45.10	0.0006	0.0005
3.02	31.60	30.18	0.06	0.99	7.85	0.0001	0.0001
55.15	607.72	289.22	33.28	34.34	101.43	0.0029	0.0020
34.82	269.91	202.46	3.03	12.04	61.60	0.0004	0.0003
48.76	520.00	380.48	32.40	49.59	163.31	0.0057	0.0041
58.42	623.01	456.57	38.88	59.51	195.97	0.0165	0.0118
58.42	623.01	456.57	38.88	59.51	195.97	0.0165	0.0118
77.89	830.69	608.76	51.85	79.34	261.30	0.0220	0.0157
58.42	623.01	456.57	38.88	59.51	195.97	0.0165	0.0118
63.29	674.93	494.62	42.12	64.47	212.31	0.0179	0.0128
48.76	520.00	380.48	32.40	49.59	163.31	0.0057	0.0041
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000

Emission rates reflect engine HP and load factor; operating time factor is accounted for separately in net engine-hours calculations.

CONSTRUCTION ACTIVITY EMISSIONS SUMMARY

LAUGHLIN AFB SOLAR PROJECT - ALTERNATIVE A - SITE 2
CONSTRUCTION YEAR: 2011

EQUIPMENT USE SUMMARY:

PROJECT PHASE	ACTIVITY DURATION, WORKING DAYS	ACREAGE SUBJECT TO DISTURBANCE	TOTAL NUMBER OF EQUIPMENT ITEMS	HOURS OF ON-SITE EQUIPMENT USE	ON-SITE EQUIPMENT FUEL USE, GALLONS	TRUCK TRAFFIC (1-way trips): TRUCK TRIPS TO/ FROM SITE	TRUCK TRAFFIC (1-way trips): TRUCK TRIPS PER DAY
SITE PREPARATION	50	75.0	24	1,659	10,575	133	2.7
UNDERGROUND CABLES	15	2.3	15	309	1,011	114	7.6
ARRAY INSTALLATON	60	26.3	16	1,083	2,421	379	6.3
BUILDING AND SWITCHES	15	0.4	12	73	316	60	4.0
NET WORKING DAYS AND TOTALS:	**110**			**3,123**	**14,323**	**686**	**21**
MINIMUM PHASE:		**0.4**	**12**				**2.7**
MEAN OVER NET WORK PERIOD:		**38.3**	**23**				**6.2**
MAXIMUM PHASE:		**75.0**	**24**				**7.6**

Partially overlapping construction phases.

CONSTRUCTION WORKER TRIP ESTIMATES: **TAB OVER ==> FOR VEHICLE OCCUPANCY CALCS WORK AREA**

PHASE	ON-SITE EQUIP ITEMS	EQUIPMENT OPERATORS	SUPERVISORS	SPECIALTY TRADES	OTHER WORKERS	TOTAL WORKERS	VEHICLE OCCUPANCY	1-WAY VEHICLE TRIPS: TOTAL	1-WAY VEHICLE TRIPS: PER DAY
SITE PREPARATION	10	6	1	0	4	11	1.10	1,000	20
UNDERGROUND CABLES	7	4	1	0	2	7	1.17	179	12
ARRAY INSTALLATON	8	6	2	2	8	18	1.13	1,912	32
BUILDING AND SWITCHES	5	2	1	2	4	9	1.13	239	16
MAX PHASE	**10**					**18**		**1,912**	**32**
TOTAL OR MAX DAILY						**45**		**3,330**	**80**

Partially overlapping construction phases.

On-site equipment equations in Column B read data from the Optional Work Area on the Main Calcs sheet. If Optional Work Area not used, leave Column B alone and manually enter Number of Equipment Operators in Column C.
Specialty trades include carpenters, plumbers, electricians, welders, etc. Most likely to be present during utility line installation, building shell construction, and interior finishing type phases.
Base Other Workers on estimated work crew size for nubmer of units or number of acres worked per day.

CALENDAR QUARTER PHASE OVERLAP CALCULATOR: **Total Work Days =** **110**

PHASE	Q1	Q2	Q3	Q4
	WORK DAYS PER QUARTER			
SITE PREPARATION	0	50	0	0
UNDERGROUND CABLES	0	15	0	0
ARRAY INSTALLATON	0	0	60	0
BUILDING AND SWITCHES	0	0	15	0
Available Work Days per Quarter	**61**	**64**	**64**	**64**

POLLUTANT	Q1	Q2	Q3	Q4
	EMISSIONS BY QUARTER, TONS			
ROG	0.00	0.17	0.04	0.00
NOx	0.00	1.40	0.26	0.00
CO	0.00	0.91	0.21	0.00
SOx	0.00	0.09	0.01	0.00
PM_{10}	0.00	1.05	0.09	0.00

	5-day week	6-day week	7-day week	
Q1	61	75	88	
Q2	64	77	89	
Q3	64	77	90	
Q4	65	77	89	Note: may wa
AVERAGE	63.5	76.5	89	
SUM	254	306	356	

Note: Analysis assumes a 5-day work week with allowances for major holidays.
Calendar quarters used in an absolute sense. Construction expected to start in January 2006.

ARCHIVED EQUATIONS FOR CALENDAR QUARTER PHASE OVERLAP CALCULATOR: **Total Work Days =** **0**

ignore displayed values of equations below and simply copy them back as necessary to the Calculator section above

61	64	64	65	Work days by calendar qua

PHASE	Q1	Q2	Q3	Q4
SITE PREPARATION	0	0	0	0
UNDERGROUND CABLES		0	0	0
ARRAY INSTALLATON		0	0	0
BUILDING AND SWITCHES	0	0	0	0

	5-day week	6-day week	7-day week	
Q1	61	75	88	
Q2	64	77	89	
Q3	64	77	90	
Q4	65	77	89	Note: may wa
AVERAGE	63.5	76.5	89	
SUM	254	306	356	

SEASONAL VARIATION IN NATURAL CONTROL OF FUGITIVE DUST Del Rio Airport, 1951-2007 data

PARAMETER	QUARTER 1	QUARTER 2	QUARTER 3	QUARTER 4	ANNUAL
Percent Days with Meaningful Precipitation	16.7%	18.7%	15.2%	15.2%	16.4%
Percent Days with Frozen Ground or Snow	0.0%	0.0%	0.0%	0.0%	0.0%
Control Factor for Natural Soil Moisture	0.0%	0.0%	0.0%	0.0%	0.0%
DAILY NATURAL CONTROL	0.0%	0.0%	0.0%	0.0%	
QUARTERLY NATURAL CONTROL	16.7%	18.7%	15.2%	15.2%	16.4%
Days per Calendar Quarter	90	91	92	92	365

Precipitation control is typically the % days with more than 0.01" of precipitation (this assumes that counting low precipitation days compensates for high precipitation days that control fugitive dust for multiple days). A higher precipitation threshold may be appropriate in hot desert areas.
Precipitation threhsold of 0.01 inches used for all quarters.
The entry for natural soil moisture conditions is an overall % emissions control, not % of days affected by this condition (seeps, perched water table, etc.).
Daily contorl of fugituve dust from soil disturbance is influenced only by control from natural soil moisture levels, unless either % days with precipitation or % days with frozen ground or snow cover is 100% of days in a calendar quarter.
Quarterly natural control is either control by natural soil moisture or by the sum of % days with precipitation, frozen ground, and snow, whichever is greater.
Natural dust control factors are applied to the residual fugitive dust remaining after active dust controls. For a conservative analysis, use 0% for all entries.

CRITERIA POLLUTANT EMISSIONS, TYPICAL CONSTRUCTION DAY: 2011

PROJECT PHASE	COMPONENT	DAILY EMISSIONS, POUNDS PER DAY ROG	NOx	CO	SOx	PM_{10}	$PM_{2.5}$	DPM
SITE PREPARATION	Equipment	6.35	51.81	33.11	3.40	5.15	4.74	5.15
	Fugitive Dust	0.00	0.00	0.00	0.00	45.00	15.75	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**6.35**	**51.81**	**33.11**	**3.40**	**50.15**	**20.49**	**5.15**
UNDERGROUND CABLES	Equipment	1.82	14.12	10.48	0.44	0.89	0.82	0.89
	Fugitive Dust	0.00	0.00	0.00	0.00	0.75	0.26	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**1.82**	**14.12**	**10.48**	**0.44**	**1.64**	**1.08**	**0.89**
ARRAY INSTALLATON	Equipment	1.07	7.67	6.25	0.21	0.46	0.42	0.46
	Fugitive Dust	0.00	0.00	0.00	0.00	2.20	0.77	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**1.07**	**7.67**	**6.25**	**0.21**	**2.66**	**1.19**	**0.46**
BUILDING AND SWITCHES	Equipment	0.46	4.30	2.92	0.19	0.30	0.28	0.30
	Fugitive Dust	0.00	0.00	0.00	0.00	2.07	0.72	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.46**	**4.30**	**2.92**	**0.19**	**2.37**	**1.00**	**0.30**
TOTALS	**Equipment**	**9.71**	**77.89**	**52.75**	**4.24**	**6.81**	**6.26**	**6.81**
	Fugitive Dust	**0.00**	**0.00**	**0.00**	**0.00**	**50.02**	**17.51**	**0.00**
	Fugitive ROG	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	TOTAL	**9.71**	**77.89**	**52.75**	**4.24**	**56.82**	**23.77**	**6.81**
MAXIMUM DAY	**Equipment**	**8.18**	**65.92**	**43.59**	**3.84**	**6.05**	**5.56**	**6.05**
	Fugitive Dust	**0.00**	**0.00**	**0.00**	**0.00**	**45.75**	**16.01**	**0.00**
	Fugitive ROG	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	TOTAL	**8.18**	**65.92**	**43.59**	**3.84**	**51.80**	**21.58**	**6.05**

Totals apply only if phase durations or subarea sequencings require all phases to overlap at some point during the construction period.
Partially overlapping construction phases.
Maximum day estimates made on a pollutant-by-pollutant basis, accounting for expected overlaps among construction phases.
ROG = reactive organic compounds (ozone precursor)
NOx = nitrogen oxides (ozone precursor)
CO = carbon monoxide
SOx = sulfur oxides
PM_{10} = inhalable particulate matter (below 50 microns aerodynamic equivalent diameter); the "10" in PM_{10} is the size with 50% mass collection efficiency in a certified sampler, not an upper particle size limit
$PM_{2.5}$ = fine particulate matter (below 6 microns aerodynamic equivalent diameter); the "2.5" in $PM_{2.5}$ is the size with 50% mass collection efficiency in a certified sampler, not an upper particle size limit
DPM = diesel particulate matter (carcinogen)

CRITERIA POLLUTANT EMISSIONS FOR CONSTRUCTION YEAR: 2011

PROJECT PHASE	COMPONENT	TOTAL EMISSIONS, TONS PER YEAR						
		ROG	NOx	CO	SOx	PM_{10}	$PM_{2.5}$	DPM
SITE PREPARATION	Equipment	0.16	1.30	0.83	0.09	0.13	0.12	0.13
	Fugitive Dust	0.00	0.00	0.00	0.00	0.91	0.32	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.16**	**1.30**	**0.83**	**0.09**	**1.04**	**0.44**	**0.13**
UNDERGROUND CABLES	Equipment	0.01	0.11	0.08	0.00	0.01	0.01	0.01
	Fugitive Dust	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.01**	**0.11**	**0.08**	**0.00**	**0.01**	**0.01**	**0.01**
ARRAY INSTALLATON	Equipment	0.03	0.23	0.19	0.01	0.01	0.01	0.01
	Fugitive Dust	0.00	0.00	0.00	0.00	0.06	0.02	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.03**	**0.23**	**0.19**	**0.01**	**0.07**	**0.03**	**0.01**
BUILDING AND SWITCHES	Equipment	0.00	0.03	0.02	0.00	0.00	0.00	0.00
	Fugitive Dust	0.00	0.00	0.00	0.00	0.01	0.00	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.03**	**0.02**	**0.00**	**0.02**	**0.01**	**0.00**
TOTALS	**Equipment**	**0.21**	**1.66**	**1.12**	**0.10**	**0.15**	**0.14**	**0.15**
	Fugitive Dust	**0.00**	**0.00**	**0.00**	**0.00**	**0.99**	**0.35**	**0.00**
	Fugitive ROG	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	TOTAL	**0.21**	**1.66**	**1.12**	**0.10**	**1.14**	**0.49**	**0.15**
MAX CALENDAR QUARTER	**Equipment**	**0.17**	**1.40**	**0.91**	**0.09**	**0.14**	**0.12**	**0.14**
	Fugitive Dust	**0.00**	**0.00**	**0.00**	**0.00**	**0.92**	**0.40**	**0.00**
	Fugitive ROG	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	TOTAL	**0.17**	**1.40**	**0.91**	**0.09**	**1.05**	**0.52**	**0.14**

Maximum calendar quarter estimates made on a pollutant-by-pollutant basis, accounting for expected overlaps among construction phases.
ROG = reactive organic compounds (ozone precursor)
NOx = nitrogen oxides (ozone precursor)
CO = carbon monoxide
SOx = sulfur oxides
PM_{10} = inhalable particulate matter (below 50 microns aerodynamic equivalent diameter); the "10" in PM_{10} is the size with 50% mass collection efficiency in a certified sampler, not an upper particle size limit
$PM_{2.5}$ = fine particulate matter (below 6 microns aerodynamic equivalent diameter); the "2.5" in $PM_{2.5}$ is the size with 50% mass collection efficiency in a certified sampler, not an upper particle size limit
DPM = diesel particulate matter (carcinogen)

FUGITIVE EMISSIONS DETAILS BY PHASE:

PARAMETER	PHASE 1	PHASE 2	PHASE 3	PHASE 4
Assumed Soil Texture Class	sandy loam	sandy loam	sandy loam	sandy loam
Soil PM_{10} Fraction	25.0%	25.0%	25.0%	25.0%
Active Dust Control Program Effectiveness	50%	50%	50%	50%
Natural Dust Control, Daily Basis	0.0%	0.0%	0.0%	0.0%
Natural Dust Control, Annual Basis	18.7%	18.7%	15.2%	15.2%
Area Disturbed on a Typical Day, acres	4.50	0.15	0.44	0.41
Days of Disturbance	50	15	60	15
Uncontrolled TSP Rate, lbs/acre-day	80.0	40.0	40.0	40.0
Controlled PM_{10} Rate, lbs/acre-day	10.0	5.0	5.0	5.0
Demolition PM_{10}, total pounds	0.0	0.0	0.0	0.0
Construction Blasting PM_{10}, total pounds	0.0	0.0	0.0	0.0
Acres of asphalt paving	0.00	0.00	0.00	0.00
Painted Surface Area, square feet	0	0	0	0
$PM_{2.5}$ fraction of engine exhaust PM_{10}	92.0%	92.0%	92.0%	92.0%
$PM_{2.5}$ fraction of fugitive dust PM_{10}	35.0%	35.0%	35.0%	35.0%
$PM_{2.5}$ fraction of spray paint PM_{10}	91.2%	91.2%	91.2%	91.2%

$PM_{2.5}$ fractions of diesel engine exhaust PM_{10} and spray paint PM_{10} are based on data from the California Air Resources Board CEIDA (California Emission Inventory Data and Reporting System) database, as presented in Appendix A of SCAQMD 2003, Final Methodology to Calculate $PM_{2.5}$ and $PM_{2.5}$ Significance Thresholds.

$PM_{2.5}$ fraction of fugitive dust PM_{10} based on typical clay and fine silt content for soils texture class.

Natural dust control factors are applied to the residual fugitive dust remaining after active dust controls.

$PM_{2.5}$ fractions from the CARB CEIDARS database are 92% to 97.6% for diesel vehicle exhaust, 20.8% to 57.8% for construction site dust, and 91.2% to 96.4% for spray painting. See the FUGITIVE DUST DATABASE worksheet for details.

GLOBAL WARMING POTENTIAL DATA SET SELECTION:

DATA SOURCE	DATA SET CODE	GWP FOR CH_4	GWP FOR N_2O
IPCC 2nd Assessment, 1995:	1	21	310
IPCC 3rd Assessment, 2001:	2	23	296
IPCC 4th Assessment, 2007:	3	25	298

SELECTED GWP DATA SET (1, 2, or 3) =	3
CH_4 factor:	25
N_2O factor:	298

GREENHOUSE GAS EMISSIONS SUMMARY: 2011

Metric tons per short ton = 0.907184749

PROJECT PHASE	AVERAGE DAILY GHG EMISSIONS, POUNDS PER DAY			
	CO_2	CH_4	N_2O	GWP, CO_2e
SITE PREPARATION	4,644.1	0.14	0.10	**4,677.4**
UNDERGROUND CABLES	1,479.6	0.05	0.04	**1,491.8**
ARRAY INSTALLATON	885.9	0.04	0.03	**894.5**
BUILDING AND SWITCHES	463.1	0.02	0.01	**468.1**
MAXIMUM DAY:	**6,123.7**	**0.19**	**0.14**	**6,169.3**

PROJECT PHASE	TOTAL GHG EMISSIONS, TONS PER YEAR				TOTAL GHG EMISSIONS, METRIC TONS PER YEAR			
	CO_2	CH_4	N_2O	GWP, CO_2e	CO_2	CH_4	N_2O	GWP, CO_2e
SITE PREPARATION	116.1	0.003	0.002	**116.9**	105.3	0.003	0.002	**106.1**
UNDERGROUND CABLES	11.1	0.000	0.000	**11.2**	10.1	0.000	0.000	**10.2**
ARRAY INSTALLATON	26.6	0.001	0.001	**26.8**	24.1	0.001	0.001	**24.3**
BUILDING AND SWITCHES	3.5	0.000	0.000	**3.5**	3.2	0.000	0.000	**3.2**
MAXIMUM QUARTER:	**127.2**	**0.004**	**0.003**	**128.1**	**115.4**	**0.004**	**0.003**	**116.2**
CONSTRUCTION PERIOD TOTALS:	**157.3**	**0.005**	**0.004**	**158.5**	**142.7**	**0.005**	**0.003**	**143.8**

GHG = greenhouse gas
CO_2 = carbon dioxide; GWP multiplier = 1
CH_4 = methane; GWP multiplier = 25
N_2O = nitrous oxide; GWP multiplier = 298
GWP = global warming potential, CO_2 equivalents (CO_2e) from Intergovernmental Panel on Climate Change (IPCC) 2007 fourth assessment report, 100 year time frame
Maximum day estimates based on expected overlaps among construction phases.

FORMATTED FOOTNOTE SETS:

GWP Data Set 1 footnotes:

CH_4 = methane; GWP multiplier = 21

N_2O = nitrous oxide; GWP multiplier = 310

GWP = global warming potential, CO_2 equivalents (CO_2e) from Intergovernmental Panel on Climate Change (IPCC) 1995 second assessment report, 100 year time frame

GWP Data Set 2 footnotes:

CH_4 = methane; GWP multiplier = 23

N_2O = nitrous oxide; GWP multiplier = 296

GWP = global warming potential, CO_2 equivalents (CO_2e) from Intergovernmental Panel on Climate Change (IPCC) 2001 third assessment report, 100 year time frame

GWP Data Set 3 footnotes:

CH_4 = methane; GWP multiplier = 25

N_2O = nitrous oxide; GWP multiplier = 298

GWP = global warming potential, CO_2 equivalents (CO_2e) from Intergovernmental Panel on Climate Change (IPCC) 2007 fourth assessment report, 100 year time frame

CALENDAR QUARTER CRITERIA POLLUTANT EMISSIONS: 2011

CALENDAR QUARTER	COMPONENT	CRITERIA POLLUTANT EMISSIONS, TONS BY CALENDAR QUARTER						
		ROG	NOx	CO	SOx	PM_{10}	$PM_{2.5}$	DPM
QUARTER 1	Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Fugitive Dust	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
QUARTER 2	Equipment	0.17	1.40	0.91	0.09	0.14	0.12	0.14
	Fugitive Dust	0.00	0.00	0.00	0.00	0.92	0.40	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.17**	**1.40**	**0.91**	**0.09**	**1.05**	**0.52**	**0.14**
QUARTER 3	Equipment	0.04	0.26	0.21	0.01	0.02	0.01	0.02
	Fugitive Dust	0.00	0.00	0.00	0.00	0.07	0.03	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.04**	**0.26**	**0.21**	**0.01**	**0.09**	**0.04**	**0.02**
QUARTER 4	Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Fugitive Dust	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Fugitive ROG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
MAXIMUM QUARTER	**Equipment**	**0.17**	**1.40**	**0.91**	**0.09**	**0.14**	**0.12**	**0.14**
	Fugitive Dust	**0.00**	**0.00**	**0.00**	**0.00**	**0.92**	**0.40**	**0.00**
	Fugitive ROG	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	TOTAL	**0.17**	**1.40**	**0.91**	**0.09**	**1.05**	**0.52**	**0.14**

ROG = reactive organic compounds (ozone precursor)
NOx = nitrogen oxides (ozone precursor)
CO = carbon monoxide
SOx = sulfur oxides
PM_{10} = inhalable particulate matter (below 50 microns aerodynamic equivalent diameter); the "10" in PM_{10} is the size with 50% mass collection efficiency in a certified sampler, not an upper particle size limit
$PM_{2.5}$ = fine particulate matter (below 6 microns aerodynamic equivalent diameter); the "2.5" in $PM_{2.5}$ is the size with 50% mass collection efficiency in a certified sampler, not an upper particle size limit
DPM = diesel particulate matter (carcinogen)

Metric tons per short ton = 0.907184749

CALENDAR QUARTER GHG EMISSIONS: 2011

CALENDAR QUARTER	GHG EMISSIONS, TONS BY CALENDAR QUARTER				GHG EMISSIONS, METRIC TONS BY CALENDAR QUARTER			
	CO_2	CH_4	N_2O	GWP, CO_2e	CO_2	CH_4	N_2O	GWP, CO_2e
QUARTER 1	0.0	0.000	0.000	**0.0**	0.0	0.000	0.000	**0.0**
QUARTER 2	127.2	0.004	0.003	**128.1**	115.4	0.004	0.003	**116.2**
QUARTER 3	30.1	0.001	0.001	**30.3**	27.3	0.001	0.001	**27.5**
QUARTER 4	0.0	0.000	0.000	**0.0**	0.0	0.000	0.000	**0.0**
MAXIMUM QUARTER	**127.2**	**0.004**	**0.003**	**128.1**	**115.4**	**0.004**	**0.003**	**116.2**

GHG = greenhouse gas
CO_2 = carbon dioxide; GWP multiplier = 1
CH_4 = methane; GWP multiplier = 25
N_2O = nitrous oxide; GWP multiplier = 298
GWP = global warming potential, CO_2 equivalents (CO_2e) from Intergovernmental Panel on Climate Change (IPCC) 2007 fourth assessment report, 100 year time frame

NATURAL CONTROL OF DAILY FUGITIVE DUST BY PHASE

CALENDAR QUARTER	PHASE 1	PHASE 2	PHASE 3	PHASE 4
QUARTER 1	0.0%	0.0%	0.0%	0.0%
QUARTER 2	0.0%	0.0%	0.0%	0.0%
QUARTER 3	0.0%	0.0%	0.0%	0.0%
QUARTER 4	0.0%	0.0%	0.0%	0.0%
DAILY AVERAGE BY PHASE	**0.0%**	**0.0%**	**0.0%**	**0.0%**

NATURAL CONTROL OF ANNUAL FUGITIVE DUST BY PHASE

CALENDAR QUARTER	PHASE 1	PHASE 2	PHASE 3	PHASE 4
QUARTER 1	0.0%	0.0%	0.0%	0.0%
QUARTER 2	18.7%	18.7%	0.0%	0.0%
QUARTER 3	0.0%	0.0%	15.2%	15.2%
QUARTER 4	0.0%	0.0%	0.0%	0.0%
ANNUAL AVERAGE BY PHASE	**18.7%**	**18.7%**	**15.2%**	**15.2%**

EQUIPMENT USE DETAILS, PHASE 1: SITE PREPARATION

EQUIPMENT ITEM	ENGINE HP	LOAD FACTOR	OPERATING FACTOR	NUMBER OF ITEMS	HOURS PER DAY	FUEL USE RATE, gal/hr
Small Tracked Brush Cutter, 25 - 75 HP	55	52%	85%	0	0	1.94
Medium Tracked Dozer, 175 - 750 HP	250	59%	85%	4	6	7.70
Medium Motor Grader, 75 - 175 HP	150	54%	85%	1	2	4.23
Small Wheeled Loader, 75 - 175 HP	125	54%	75%	1	4	3.52
Medium Standard Roller/Compactor, 75 - 175 HP	100	59%	85%	1	4	3.08
Medium Chippers & Stump Grinders, 25 - 75 HP	40	37%	65%	0	0	0.86
Small Wheeled Tractor, 25 - 75 HP	70	38%	85%	1	2	1.80
Medium Trencher, 75 -175 HP	100	64%	85%	0	0	3.34
Small Tracked Cable Plow, 75 - 175 HP	80	57%	85%	0	0	3.09
Small Wheeled Backhoe-Loader, 25 - 75 HP	70	38%	85%	0	0	1.80
Medium Rough Terrain Forklift, 75 - 175 HP	100	35%	65%	0	0	1.83
Small Line Pullers, 25 - 50 HP	44	75%	75%	0	0	1.91
Small Excavator-Mounted Auger, 25 - 75 HP	60	59%	45%	0	0	2.05
Portable Cement/Mortar Mixer, < 25 HP	11	56%	90%	0	0	0.36
Small Wheeled Dozer, 75 - 175 HP	150	59%	85%	0	0	4.62
Small Mobile Crane, 75 - 175 HP	125	43%	75%	0	0	2.81
Medium (2,000 gal) Water Truck, 175 - 750 HP	250	57%	65%	2	2	7.44
Medium Equipment Transporter, 175 - 750 HP	300	57%	25%	11	0	8.92
10-Ton (7-10 yd) Dump Truck, 175 - 750 HP	300	57%	25%	1	0	8.92
20-Ton (15-20 yd) Dump Truck, 175 - 750 HP	400	57%	25%	1	1	11.90
Medium Flatbed Truck, 175 - 750 HP	300	57%	25%	0	0	8.92
Medium (7-9 Yard) Cement Mixer Truck	325	57%	40%	0	0	9.67
Medium (2,000 gallon) Fuel Truck, 175 - 750 HP	250	57%	65%	1	0	7.44
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00

Heavy truck hourly operating factor reflects on-site and immediate vicinity use only.

CRITERIA POLLUTANT EMISSION RATE, GRAMS/HOUR					GHG EMISSION RATE, LBS/HOUR		
ROG	NOx	CO	SOx	PM10	CO_2	CH_4	N_2O
28.60	131.41	105.82	0.27	4.58	42.57	0.0012	0.0009
113.37	888.48	567.38	63.15	94.89	169.04	0.0048	0.0034
89.97	544.75	303.59	28.50	41.34	92.83	0.0039	0.0028
37.02	434.98	275.74	14.83	30.11	77.36	0.0033	0.0023
32.22	358.86	205.91	15.07	20.30	67.62	0.0010	0.0007
12.03	78.25	62.46	0.84	3.32	18.86	0.0003	0.0002
25.62	179.07	127.28	5.78	10.59	39.60	0.0011	0.0008
49.64	313.20	283.22	3.61	14.34	73.35	0.0010	0.0007
39.03	306.93	186.28	9.90	18.70	67.88	0.0019	0.0014
25.62	179.07	127.28	5.78	10.59	39.60	0.0011	0.0008
33.86	155.80	158.90	1.97	7.84	40.11	0.0017	0.0012
30.19	196.85	145.70	7.84	12.80	42.04	0.0006	0.0004
14.16	212.04	138.06	2.00	7.93	45.10	0.0006	0.0005
3.02	31.60	30.18	0.06	0.99	7.85	0.0001	0.0001
55.15	607.72	289.22	33.28	34.34	101.43	0.0029	0.0020
34.82	269.91	202.46	3.03	12.04	61.60	0.0004	0.0003
48.76	520.00	380.48	32.40	49.59	163.31	0.0057	0.0041
58.42	623.01	456.57	38.88	59.51	195.97	0.0165	0.0118
58.42	623.01	456.57	38.88	59.51	195.97	0.0165	0.0118
77.89	830.69	608.76	51.85	79.34	261.30	0.0220	0.0157
58.42	623.01	456.57	38.88	59.51	195.97	0.0165	0.0118
63.29	674.93	494.62	42.12	64.47	212.31	0.0179	0.0128
48.76	520.00	380.48	32.40	49.59	163.31	0.0057	0.0041
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000

Emission rates reflect engine HP and load factor; operating time factor is accounted for separately in net engine-hours calculations.

EQUIPMENT USE DETAILS, PHASE 2: UNDERGROUND CABLES

EQUIPMENT ITEM	ENGINE HP	LOAD FACTOR	OPERATING FACTOR	NUMBER OF ITEMS	HOURS PER DAY	FUEL USE RATE, gal/hr
Small Tracked Brush Cutter, 25 - 75 HP	55	52%	85%	0	0	1.94
Medium Tracked Dozer, 175 - 750 HP	250	59%	85%	0	0	7.70
Medium Motor Grader, 75 - 175 HP	150	54%	85%	0	0	4.23
Small Wheeled Loader, 75 - 175 HP	125	54%	75%	1	4	3.52
Medium Standard Roller/Compactor, 75 - 175 HP	100	59%	85%	0	0	3.08
Medium Chippers & Stump Grinders, 25 - 75 HP	40	37%	65%	0	0	0.86
Small Wheeled Tractor, 25 - 75 HP	70	38%	85%	0	0	1.80
Medium Trencher, 75 -175 HP	100	64%	85%	1	6	3.34
Small Tracked Cable Plow, 75 - 175 HP	80	57%	85%	1	6	3.09
Small Wheeled Backhoe-Loader, 25 - 75 HP	70	38%	85%	1	2	1.80
Medium Rough Terrain Forklift, 75 - 175 HP	100	35%	65%	1	4	1.83
Small Line Pullers, 25 - 50 HP	44	75%	75%	1	2	1.91
Small Excavator-Mounted Auger, 25 - 75 HP	60	59%	45%	0	0	2.05
Portable Cement/Mortar Mixer, < 25 HP	11	56%	90%	0	0	0.36
Small Wheeled Dozer, 75 - 175 HP	150	59%	85%	0	0	4.62
Small Mobile Crane, 75 - 175 HP	125	43%	75%	0	0	2.81
Medium (2,000 gal) Water Truck, 175 - 750 HP	250	57%	65%	1	1	7.44
Medium Equipment Transporter, 175 - 750 HP	300	57%	25%	4	0.134	8.92
10-Ton (7-10 yd) Dump Truck, 175 - 750 HP	300	57%	25%	3	1	8.92
20-Ton (15-20 yd) Dump Truck, 175 - 750 HP	400	57%	25%	0	0	11.90
Medium Flatbed Truck, 175 - 750 HP	300	57%	25%	1	0.27	8.92
Medium (7-9 Yard) Cement Mixer Truck	325	57%	40%	0	0	9.67
Medium (2,000 gallon) Fuel Truck, 175 - 750 HP	250	57%	65%	0	0	7.44
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00

Heavy truck hourly operating factor reflects on-site and immediate vicinity use only.

CRITERIA POLLUTANT EMISSION RATE, GRAMS/HOUR					GHG EMISSION RATE, LBS/HOUR		
ROG	NOx	CO	SOx	PM10	CO_2	CH_4	N_2O
28.60	131.41	105.82	0.27	4.58	42.57	0.0012	0.0009
113.37	888.48	567.38	63.15	94.89	169.04	0.0048	0.0034
89.97	544.75	303.59	28.50	41.34	92.83	0.0039	0.0028
37.02	434.98	275.74	14.83	30.11	77.36	0.0033	0.0023
32.22	358.86	205.91	15.07	20.30	67.62	0.0010	0.0007
12.03	78.25	62.46	0.84	3.32	18.86	0.0003	0.0002
25.62	179.07	127.28	5.78	10.59	39.60	0.0011	0.0008
49.64	313.20	283.22	3.61	14.34	73.35	0.0010	0.0007
39.03	306.93	186.28	9.90	18.70	67.88	0.0019	0.0014
25.62	179.07	127.28	5.78	10.59	39.60	0.0011	0.0008
33.86	155.80	158.90	1.97	7.84	40.11	0.0017	0.0012
30.19	196.85	145.70	7.84	12.80	42.04	0.0006	0.0004
14.16	212.04	138.06	2.00	7.93	45.10	0.0006	0.0005
3.02	31.60	30.18	0.06	0.99	7.85	0.0001	0.0001
55.15	607.72	289.22	33.28	34.34	101.43	0.0029	0.0020
34.82	269.91	202.46	3.03	12.04	61.60	0.0004	0.0003
48.76	520.00	380.48	32.40	49.59	163.31	0.0057	0.0041
58.42	623.01	456.57	38.88	59.51	195.97	0.0165	0.0118
58.42	623.01	456.57	38.88	59.51	195.97	0.0165	0.0118
77.89	830.69	608.76	51.85	79.34	261.30	0.0220	0.0157
58.42	623.01	456.57	38.88	59.51	195.97	0.0165	0.0118
63.29	674.93	494.62	42.12	64.47	212.31	0.0179	0.0128
48.76	520.00	380.48	32.40	49.59	163.31	0.0057	0.0041
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000

Emission rates reflect engine HP and load factor; operating time factor is accounted for separately in net engine-hours calculations.

EQUIPMENT USE DETAILS, PHASE 3: ARRAY INSTALLATON

EQUIPMENT ITEM	ENGINE HP	LOAD FACTOR	OPERATING FACTOR	NUMBER OF ITEMS	HOURS PER DAY	FUEL USE RATE, gal/hr
Small Tracked Brush Cutter, 25 - 75 HP	55	52%	85%	0	0	1.94
Medium Tracked Dozer, 175 - 750 HP	250	59%	85%	0	0	7.70
Medium Motor Grader, 75 - 175 HP	150	54%	85%	0	0	4.23
Small Wheeled Loader, 75 - 175 HP	125	54%	75%	0	0	3.52
Medium Standard Roller/Compactor, 75 - 175 HP	100	59%	85%	0	0	3.08
Medium Chippers & Stump Grinders, 25 - 75 HP	40	37%	65%	0	0	0.86
Small Wheeled Tractor, 25 - 75 HP	70	38%	85%	1	4	1.80
Medium Trencher, 75 -175 HP	100	64%	85%	0	0	3.34
Small Tracked Cable Plow, 75 - 175 HP	80	57%	85%	0	0	3.09
Small Wheeled Backhoe-Loader, 25 - 75 HP	70	38%	85%	0	0	1.80
Medium Rough Terrain Forklift, 75 - 175 HP	100	35%	65%	3	4	1.83
Small Line Pullers, 25 - 50 HP	44	75%	75%	0	0	1.91
Small Excavator-Mounted Auger, 25 - 75 HP	60	59%	45%	2	4	2.05
Portable Cement/Mortar Mixer, < 25 HP	11	56%	90%	1	2	0.36
Small Wheeled Dozer, 75 - 175 HP	150	59%	85%	0	0	4.62
Small Mobile Crane, 75 - 175 HP	125	43%	75%	0	0	2.81
Medium (2,000 gal) Water Truck, 175 - 750 HP	250	57%	65%	1	1	7.44
Medium Equipment Transporter, 175 - 750 HP	300	57%	25%	4	0	8.92
10-Ton (7-10 yd) Dump Truck, 175 - 750 HP	300	57%	25%	0	0	8.92
20-Ton (15-20 yd) Dump Truck, 175 - 750 HP	400	57%	25%	0	0	11.90
Medium Flatbed Truck, 175 - 750 HP	300	57%	25%	3	1	8.92
Medium (7-9 Yard) Cement Mixer Truck	325	57%	40%	0	0	9.67
Medium (2,000 gallon) Fuel Truck, 175 - 750 HP	250	57%	65%	1	0	7.44
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00

Heavy truck hourly operating factor reflects on-site and immediate vicinity use only.

Alternative A - Site 2

CRITERIA POLLUTANT EMISSION RATE, GRAMS/HOUR					GHG EMISSION RATE, LBS/HOUR		
ROG	NOx	CO	SOx	PM10	CO_2	CH_4	N_2O
28.60	131.41	105.82	0.27	4.58	42.57	0.0012	0.0009
113.37	888.48	567.38	63.15	94.89	169.04	0.0048	0.0034
89.97	544.75	303.59	28.50	41.34	92.83	0.0039	0.0028
37.02	434.98	275.74	14.83	30.11	77.36	0.0033	0.0023
32.22	358.86	205.91	15.07	20.30	67.62	0.0010	0.0007
12.03	78.25	62.46	0.84	3.32	18.86	0.0003	0.0002
25.62	179.07	127.28	5.78	10.59	39.60	0.0011	0.0008
49.64	313.20	283.22	3.61	14.34	73.35	0.0010	0.0007
39.03	306.93	186.28	9.90	18.70	67.88	0.0019	0.0014
25.62	179.07	127.28	5.78	10.59	39.60	0.0011	0.0008
33.86	155.80	158.90	1.97	7.84	40.11	0.0017	0.0012
30.19	196.85	145.70	7.84	12.80	42.04	0.0006	0.0004
14.16	212.04	138.06	2.00	7.93	45.10	0.0006	0.0005
3.02	31.60	30.18	0.06	0.99	7.85	0.0001	0.0001
55.15	607.72	289.22	33.28	34.34	101.43	0.0029	0.0020
34.82	269.91	202.46	3.03	12.04	61.60	0.0004	0.0003
48.76	520.00	380.48	32.40	49.59	163.31	0.0057	0.0041
58.42	623.01	456.57	38.88	59.51	195.97	0.0165	0.0118
58.42	623.01	456.57	38.88	59.51	195.97	0.0165	0.0118
77.89	830.69	608.76	51.85	79.34	261.30	0.0220	0.0157
58.42	623.01	456.57	38.88	59.51	195.97	0.0165	0.0118
63.29	674.93	494.62	42.12	64.47	212.31	0.0179	0.0128
48.76	520.00	380.48	32.40	49.59	163.31	0.0057	0.0041
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000

Emission rates reflect engine HP and load factor; operating time factor is accounted for separately in net engine-hours calculations.

EQUIPMENT USE DETAILS, PHASE 4: BUILDING AND SWITCHES

EQUIPMENT ITEM	ENGINE HP	LOAD FACTOR	OPERATING FACTOR	NUMBER OF ITEMS	HOURS PER DAY	FUEL USE RATE, gal/hr
Small Tracked Brush Cutter, 25 - 75 HP	55	52%	85%	0	0	1.94
Medium Tracked Dozer, 175 - 750 HP	250	59%	85%	0	0	7.70
Medium Motor Grader, 75 - 175 HP	150	54%	85%	0	0	4.23
Small Wheeled Loader, 75 - 175 HP	125	54%	75%	1	1	3.52
Medium Standard Roller/Compactor, 75 - 175 HP	100	59%	85%	0	0	3.08
Medium Chippers & Stump Grinders, 25 - 75 HP	40	37%	65%	0	0	0.86
Small Wheeled Tractor, 25 - 75 HP	70	38%	85%	0	0	1.80
Medium Trencher, 75 -175 HP	100	64%	85%	0	0	3.34
Small Tracked Cable Plow, 75 - 175 HP	80	57%	85%	0	0	3.09
Small Wheeled Backhoe-Loader, 25 - 75 HP	70	38%	85%	0	0	1.80
Medium Rough Terrain Forklift, 75 - 175 HP	100	35%	65%	1	2	1.83
Small Line Pullers, 25 - 50 HP	44	75%	75%	0	0	1.91
Small Excavator-Mounted Auger, 25 - 75 HP	60	59%	45%	0	0	2.05
Portable Cement/Mortar Mixer, < 25 HP	11	56%	90%	0	0	0.36
Small Wheeled Dozer, 75 - 175 HP	150	59%	85%	1	1	4.62
Small Mobile Crane, 75 - 175 HP	125	43%	75%	1	1	2.81
Medium (2,000 gal) Water Truck, 175 - 750 HP	250	57%	65%	1	1	7.44
Medium Equipment Transporter, 175 - 750 HP	300	57%	25%	4	0.13	8.92
10-Ton (7-10 yd) Dump Truck, 175 - 750 HP	300	57%	25%	1	0.6	8.92
20-Ton (15-20 yd) Dump Truck, 175 - 750 HP	400	57%	25%	0	0	11.90
Medium Flatbed Truck, 175 - 750 HP	300	57%	25%	1	0.4	8.92
Medium (7-9 Yard) Cement Mixer Truck	325	57%	40%	1	0.47	9.67
Medium (2,000 gallon) Fuel Truck, 175 - 750 HP	250	57%	65%	0	0	7.44
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00
not used	1	100%	100%	0	0	0.00

Heavy truck hourly operating factor reflects on-site and immediate vicinity use only.

CRITERIA POLLUTANT EMISSION RATE, GRAMS/HOUR					GHG EMISSION RATE, LBS/HOUR		
ROG	NOx	CO	SOx	PM10	CO_2	CH_4	N_2O
28.60	131.41	105.82	0.27	4.58	42.57	0.0012	0.0009
113.37	888.48	567.38	63.15	94.89	169.04	0.0048	0.0034
89.97	544.75	303.59	28.50	41.34	92.83	0.0039	0.0028
37.02	434.98	275.74	14.83	30.11	77.36	0.0033	0.0023
32.22	358.86	205.91	15.07	20.30	67.62	0.0010	0.0007
12.03	78.25	62.46	0.84	3.32	18.86	0.0003	0.0002
25.62	179.07	127.28	5.78	10.59	39.60	0.0011	0.0008
49.64	313.20	283.22	3.61	14.34	73.35	0.0010	0.0007
39.03	306.93	186.28	9.90	18.70	67.88	0.0019	0.0014
25.62	179.07	127.28	5.78	10.59	39.60	0.0011	0.0008
33.86	155.80	158.90	1.97	7.84	40.11	0.0017	0.0012
30.19	196.85	145.70	7.84	12.80	42.04	0.0006	0.0004
14.16	212.04	138.06	2.00	7.93	45.10	0.0006	0.0005
3.02	31.60	30.18	0.06	0.99	7.85	0.0001	0.0001
55.15	607.72	289.22	33.28	34.34	101.43	0.0029	0.0020
34.82	269.91	202.46	3.03	12.04	61.60	0.0004	0.0003
48.76	520.00	380.48	32.40	49.59	163.31	0.0057	0.0041
58.42	623.01	456.57	38.88	59.51	195.97	0.0165	0.0118
58.42	623.01	456.57	38.88	59.51	195.97	0.0165	0.0118
77.89	830.69	608.76	51.85	79.34	261.30	0.0220	0.0157
58.42	623.01	456.57	38.88	59.51	195.97	0.0165	0.0118
63.29	674.93	494.62	42.12	64.47	212.31	0.0179	0.0128
48.76	520.00	380.48	32.40	49.59	163.31	0.0057	0.0041
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000

Emission rates reflect engine HP and load factor; operating time factor is accounted for separately in net engine-hours calculations.

VEHICLE EMISSIONS - LAUGHLIN AFB SOLAR PROJECT CONSTRUCTION TRAFFIC 2011

25	GWP for CH4	IPCC 2007 data
298	GWP for N2O	IPCC 2007 data
Grams per pound =	453.592	

CONSTRUCTION WORKER COMMUTE TRIPS, PROPOSED PROJECT, 2011

	TOTAL	1-WAY		MOBILE 6.2 EMISSION RATES, GRAMS PER VMT							GRAMS PER VMT			
	1-WAY TRIPS	MILES	DAYS	ROG	NOx	CO	SOx	PM10	PM2.5	DPM	CO2	CH4	N2O	CO2e
EMISSION RATE SETUP														
Site Preparation	1,565	10	60	0.83	0.59	9.23	0.01	0.03	0.004	0.0001	458.28	0.0001	0.0001	**458.31**
Underground Cables	179	10	15	0.83	0.59	9.23	0.01	0.03	0.004	0.0001	458.28	0.0001	0.0001	**458.31**
Array Inatallation	1,912	10	60	0.83	0.59	9.23	0.01	0.03	0.004	0.0001	458.28	0.0001	0.0001	**458.31**
Building and Switches	239	10	15	0.83	0.59	9.23	0.01	0.03	0.004	0.0001	458.28	0.0001	0.0001	**458.31**

	POUNDS PER DAY							POUNDS PER DAY			
DAILY EMISSIONS	ROG	NOx	CO	SOx	PM10	PM2.5	DPM	CO2	CH4	N2O	CO2e
WORKER VEHICLE EMISSIONS FOR PROJECT											
Site Preparation	0.48	0.34	5.31	0.00	0.01	0.003	0.0001	264	0.0001	0.0001	**263.58**
Underground Cables	0.22	0.16	2.44	0.00	0.01	0.001	0.0000	121	0.0000	0.0000	**120.90**
Array Inatallation	0.58	0.41	6.48	0.01	0.02	0.003	0.0001	322	0.0001	0.0001	**321.90**
Building and Switches	0.29	0.21	3.24	0.00	0.01	0.002	0.0000	161	0.0000	0.0000	**160.95**
MAXIMUM DAY	**0.58**	**0.41**	**6.48**	**0.01**	**0.02**	**0.003**	**0.0001**	**322**	**0.0001**	**0.0001**	**321.90**

	TONS PER YEAR							TONS PER YEAR			
ANNUAL EMISSIONS	ROG	NOx	CO	SOx	PM10	PM2.5	DPM	CO2	CH4	N2O	CO2e
WORKER VEHICLE EMISSIONS FOR PROJECT											
Site Preparation	0.01	0.01	0.16	0.000	0.000	0.000	0.0000	7.91	0.0000	0.0000	**7.91**
Underground Cables	0.00	0.00	0.02	0.000	0.000	0.000	0.0000	0.91	0.0000	0.0000	**0.91**
Array Inatallation	0.02	0.01	0.19	0.000	0.001	0.000	0.0000	9.66	0.0000	0.0000	**9.66**
Building and Switches	0.00	0.00	0.02	0.000	0.000	0.000	0.0000	1.21	0.0000	0.0000	**1.21**
TOTAL	**0.04**	**0.03**	**0.40**	**0.000**	**0.001**	**0.000**	**0.0000**	**19.68**	**0.0000**	**0.0000**	**19.68**

CONSTRUCTION TRUCK TRAFFIC, PROPOSED PROJECT, 2011

	TOTAL	1-WAY		MOBILE 6.2 EMISSION RATES, GRAMS PER VMT							GRAMS PER VMT			
	1-WAY TRIPS	MILES	DAYS	ROG	NOx	CO	SOx	PM10	PM2.5	DPM	CO2	CH4	N2O	CO2e
EMISSION RATE SETUP														
Site Preparation	197	15	60	0.37	5.91	1.52	0.01	0.18	0.14	0.14	1,416.20	0.0001	0.0001	**1,416.24**
Underground Cables	132	25	15	0.37	5.91	1.52	0.01	0.18	0.14	0.14	1,416.20	0.0001	0.0001	**1,416.24**
Array Inatallation	379	150	60	0.37	5.91	1.52	0.01	0.18	0.14	0.14	1,416.20	0.0001	0.0001	**1,416.24**
Building and Switches	60	25	15	0.37	5.91	1.52	0.01	0.18	0.14	0.14	1,416.20	0.0001	0.0001	**1,416.24**

	POUNDS PER DAY							POUNDS PER DAY			
DAILY EMISSIONS	ROG	NOx	CO	SOx	PM10	PM2.5	DPM	CO2	CH4	N2O	CO2e
TRUCK TRIP EMISSIONS FOR PROJECT											
Site Preparation	0.04	0.64	0.17	0.00	0.02	0.02	0.01	153.99	0.0000	0.0000	**153.99**
Underground Cables	0.18	2.87	0.74	0.01	0.09	0.07	0.07	687.82	0.0001	0.0001	**687.84**
Array Inatallation	0.77	12.34	3.18	0.03	0.37	0.29	0.29	2,956.09	0.0003	0.0002	**2,956.16**
Building and Switches	0.08	1.30	0.33	0.00	0.04	0.03	0.03	310.66	0.0000	0.0000	**310.67**
MAXIMUM DAY	**0.77**	**12.34**	**3.18**	**0.03**	**0.37**	**0.29**	**0.29**	**2,956**	**0.0003**	**0.0002**	**2,956.16**

	TONS PER YEAR							TONS PER YEAR			
ANNUAL EMISSIONS	ROG	NOx	CO	SOx	PM10	PM2.5	DPM	CO2	CH4	N2O	CO2e
TRUCK TRIP EMISSIONS FOR PROJECT											
Site Preparation	0.00	0.02	0.00	0.000	0.001	0.000	0.000	4.62	0.0000	0.0000	**4.62**
Underground Cables	0.00	0.02	0.01	0.000	0.001	0.001	0.001	5.16	0.0000	0.0000	**5.16**
Array Inatallation	0.02	0.37	0.10	0.001	0.011	0.009	0.009	88.68	0.0000	0.0000	**88.68**
Building and Switches	0.00	0.01	0.00	0.000	0.000	0.000	0.000	2.33	0.0000	0.0000	**2.33**
TOTAL	**0.03**	**0.42**	**0.11**	**0.001**	**0.013**	**0.010**	**0.010**	**100.79**	**0.0000**	**0.0000**	**100.79**

Construction workers assumed to be from the local area.
Truck trip distances assume various mixes of local truck trips (15 miles) and longer distance truck trips from the San Antonio area (150 miles).

VEHICLE EMISSIONS - LAUGHLIN AFB SOLAR PROJECT CONSTRUCTION TRAFFIC 2011

25	GWP for CH4	IPCC 2007 data
298	GWP for N2O	IPCC 2007 data
Grams per pound =	453.592	

CONSTRUCTION WORKER COMMUTE TRIPS, ALTERNATIVE A, 2011

	TOTAL	1-WAY		MOBILE 6.2 EMISSION RATES, GRAMS PER VMT							GRAMS PER VMT			
	1-WAY TRIPS	MILES	DAYS	ROG	NOx	CO	SOx	PM10	PM2.5	DPM	CO2	CH4	N2O	CO2e
EMISSION RATE SETUP														
Site Preparation	1,000	12	50	0.83	0.59	9.23	0.01	0.03	0.004	0.0001	458.28	0.0001	0.0001	**458.31**
Underground Cables	179	12	15	0.83	0.59	9.23	0.01	0.03	0.004	0.0001	458.28	0.0001	0.0001	**458.31**
Array Inatallation	1,912	12	60	0.83	0.59	9.23	0.01	0.03	0.004	0.0001	458.28	0.0001	0.0001	**458.31**
Building and Switches	239	12	15	0.83	0.59	9.23	0.01	0.03	0.004	0.0001	458.28	0.0001	0.0001	**458.31**

	POUNDS PER DAY							POUNDS PER DAY			
DAILY EMISSIONS	ROG	NOx	CO	SOx	PM10	PM2.5	DPM	CO2	CH4	N2O	CO2e
WORKER VEHICLE EMISSIONS FOR PROJECT											
Site Preparation	0.44	0.31	4.88	0.00	0.01	0.002	0.0001	242	0.0001	0.0001	**242.50**
Underground Cables	0.26	0.19	2.92	0.00	0.01	0.001	0.0000	145	0.0000	0.0000	**145.08**
Array Inatallation	0.70	0.50	7.78	0.01	0.02	0.004	0.0001	386	0.0001	0.0001	**386.28**
Building and Switches	0.35	0.25	3.89	0.00	0.01	0.002	0.0001	193	0.0000	0.0000	**193.14**
MAXIMUM DAY	**0.70**	**0.50**	**7.78**	**0.01**	**0.02**	**0.00**	**0.00**	**386**	**0.0001**	**0.0001**	**386.28**

	TONS PER YEAR							TONS PER YEAR			
ANNUAL EMISSIONS	ROG	NOx	CO	SOx	PM10	PM2.5	DPM	CO2	CH4	N2O	CO2e
WORKER VEHICLE EMISSIONS FOR PROJECT											
Site Preparation	0.01	0.01	0.12	0.000	0.000	0.000	0.0000	6.06	0.0000	0.0000	**6.06**
Underground Cables	0.00	0.00	0.02	0.000	0.000	0.000	0.0000	1.09	0.0000	0.0000	**1.09**
Array Inatallation	0.02	0.01	0.23	0.000	0.001	0.000	0.0000	11.59	0.0000	0.0000	**11.59**
Building and Switches	0.00	0.00	0.03	0.000	0.000	0.000	0.0000	1.45	0.0000	0.0000	**1.45**
TOTAL	**0.04**	**0.03**	**0.41**	**0.000**	**0.001**	**0.000**	**0.0000**	**20.19**	**0.0000**	**0.0000**	**20.19**

CONSTRUCTION TRUCK TRAFFIC, ALTERNATIVE A, 2011

	TOTAL	1-WAY		MOBILE 6.2 EMISSION RATES, GRAMS PER VMT							GRAMS PER VMT			
	1-WAY TRIPS	MILES	DAYS	ROG	NOx	CO	SOx	PM10	PM2.5	DPM	CO2	CH4	N2O	CO2e
EMISSION RATE SETUP														
Site Preparation	133	15	50	0.37	5.91	1.52	0.01	0.18	0.14	0.14	1,416.20	0.0001	0.0001	**1,416.24**
Underground Cables	114	25	15	0.37	5.91	1.52	0.01	0.18	0.14	0.14	1,416.20	0.0001	0.0001	**1,416.24**
Array Inatallation	379	150	60	0.37	5.91	1.52	0.01	0.18	0.14	0.14	1,416.20	0.0001	0.0001	**1,416.24**
Building and Switches	60	25	15	0.37	5.91	1.52	0.01	0.18	0.14	0.14	1,416.20	0.0001	0.0001	**1,416.24**

	POUNDS PER DAY							POUNDS PER DAY			
DAILY EMISSIONS	ROG	NOx	CO	SOx	PM10	PM2.5	DPM	CO2	CH4	N2O	CO2e
TRUCK TRIP EMISSIONS FOR PROJECT											
Site Preparation	0.03	0.52	0.13	0.00	0.02	0.01	0.01	124.58	0.0000	0.0000	**124.58**
Underground Cables	0.16	2.48	0.64	0.01	0.07	0.06	0.06	594.15	0.0001	0.0000	**594.17**
Array Inatallation	0.77	12.34	3.18	0.03	0.37	0.29	0.29	2,956.09	0.0003	0.0002	**2,956.16**
Building and Switches	0.08	1.30	0.33	0.00	0.04	0.03	0.03	310.66	0.0000	0.0000	**310.67**
MAXIMUM DAY	**0.77**	**12.34**	**3.18**	**0.03**	**0.37**	**0.29**	**0.29**	**2,956**	**0.0003**	**0.0002**	**2,956.16**

	TONS PER YEAR							TONS PER YEAR			
ANNUAL EMISSIONS	ROG	NOx	CO	SOx	PM10	PM2.5	DPM	CO2	CH4	N2O	CO2e
TRUCK TRIP EMISSIONS FOR PROJECT											
Site Preparation	0.00	0.01	0.00	0.000	0.000	0.000	0.000	3.11	0.0000	0.0000	**3.11**
Underground Cables	0.00	0.02	0.00	0.000	0.001	0.000	0.000	4.46	0.0000	0.0000	**4.46**
Array Inatallation	0.02	0.37	0.10	0.001	0.011	0.009	0.009	88.68	0.0000	0.0000	**88.68**
Building and Switches	0.00	0.01	0.00	0.000	0.000	0.000	0.000	2.33	0.0000	0.0000	**2.33**
TOTAL	**0.03**	**0.41**	**0.11**	**0.001**	**0.012**	**0.010**	**0.010**	**98.58**	**0.0000**	**0.0000**	**98.59**

Construction workers assumed to be from the local area.
Truck trip distances assume various mixes of local truck trips (15 miles) and longer distance truck trips from the San Antonio area (150 miles).

GHG EMISSION FACTOR FOR OVERALL TEXAS ELECTRICAL GENERATION POWER MIX - 2008

2.20462260	pounds per kilogram
0.003412	MMBTU per kW-hour
25	GWP for CH4
298	GWP for N2O
3.664191096	MW Ratio, CO2:C

EMISSION FACTORS IN POUNDS PER MILLION BTU HEAT INPUT

FUEL	PERCENT	NORMALIZED PERCENT	EMISSION FACTOR, LBS PER MMBTU			
			CO2 FACTOR	CH4 FACTOR	N2O FACTOR	GWP, CO2e
COAL	36.0%	36.0%	208.07	0.0220	0.0033	209.61
PETROLEUM	0.0%	0.0%	173.64	0.0066	0.0013	174.20
LARGE HYDRO	0.2%	0.2%	0.00	0.0000	0.0000	0.00
NATURAL GAS	49.7%	49.7%	116.89	0.0020	0.0002	117.00
NUCLEAR	9.3%	9.3%	0.00	0.0000	0.0000	0.00
BIOMASS/WASTE[1]	0.0%	0.0%	206.79	0.0661	0.0088	211.07
GEOTHERMAL	0.0%	0.0%	16.60	0.0000	0.0000	16.60
SMALL HYDRO	0.0%	0.0%	0.00	0.0000	0.0000	0.00
SOLAR	0.0%	0.0%	0.00	0.0000	0.0000	0.00
WIND	0.0%	0.0%	0.00	0.0000	0.0000	0.00
OTHER	4.9%	4.9%	0.00	0.0000	0.0000	0.00
TOTAL	**100.0%**	**100.0%**	**132.94**	**0.0089**	**0.0013**	**133.55**
RENEWABLES	**4.9%**	**4.9%**	**0.00**	**0.0000**	**0.0000**	**0.00**

Source: IPCC 2007

GHG emission factors from CARB 2008, ARB Compendium of Emission Factors and Methods to Support Mandatory Reporting of Greenhouse Gas Emissions. Residual oil assumed for petroleum fueled power plants.

1 - GHG emission factors for industrial combustion of wood used.

GHG EMISSION FACTOR FOR OVERALL TEXAS ELECTRICAL GENERATION POWER MIX - 2008

EMISSION FACTORS IN POUNDS PER KILOWATT-HOUR

FUEL	PERCENT	NORMALIZED PERCENT	EMISSION FACTOR, LBS PER KW-HR			
			CO2 FACTOR	CH4 FACTOR	N2O FACTOR	GWP, CO2e
COAL	36.0%	36.0%	0.710	0.000075	0.000011	0.715
PETROLEUM	0.0%	0.0%	0.592	0.000023	0.000005	0.594
LARGE HYDRO	0.2%	0.2%	0.000	0.000000	0.000000	0.000
NATURAL GAS	49.7%	49.7%	0.399	0.000007	0.000001	0.399
NUCLEAR	9.3%	9.3%	0.000	0.000000	0.000000	0.000
BIOMASS/WASTE	0.0%	0.0%	0.706	0.000226	0.000030	0.720
GEOTHERMAL	0.0%	0.0%	0.057	0.000000	0.000000	0.057
SMALL HYDRO	0.0%	0.0%	0.000	0.000000	0.000000	0.000
SOLAR	0.0%	0.0%	0.000	0.000000	0.000000	0.000
WIND	0.0%	0.0%	0.000	0.000000	0.000000	0.000
OTHER	4.9%	4.9%	0.000	0.000000	0.000000	0.000
TOTAL	**100.0%**	**100.0%**	**0.454**	**0.000030**	**0.000004**	**0.456**
RENEWABLES	**4.9%**	**4.9%**	**0.000**	**0.000000**	**0.000000**	**0.000**

Source: IPCC 2007

GHG emission factors from CARB 2008, ARB Compendium of Emission Factors and Methods to Support Mandatory Reporting of Greenhouse Gas Emissions. Residual oil assumed for petroleum fueled power plants.

1 - GHG emission factors for industrial combustion of wood used.

GHG EMISSION FACTOR FOR OVERALL TEXAS ELECTRICAL GENERATION POWER MIX - 2008

TEXAS POWER GENERATION

FUEL	**2008 GENERATION**	
	10^3 MW-HR	**PERCENT**
COAL	14,560	36.0%
PETROLEUM	5	0.0%
HYDROELECTRIC	76	0.2%
NATURAL GAS	20,123	49.7%
NUCLEAR	3,754	9.3%
BIOMASS/WASTE	0	0.0%
GEOTHERMAL	0	0.0%
SMALL HYDRO	0	0.0%
SOLAR	0	0.0%
WIND	0	0.0%
ALL RENEWABLES	1,970	4.9%
TOTAL	40,488	100.0%
RENEWABLES	1,970	4.9%
ZERO GHG	3,830	9.5%

Power mix based on EIA 2010 data for Texas.
EIA data do not identify biomass, small hydro, solar, or wind energy generation individually.

NATURAL GAS GHG EMISSION FACTORS

2.20462260	pounds per kilogram
100,000.0	BTU per therm

GHG EMISSIONS

BTU PER CU FT	LBS PER MMBTU			LBS PER 1000 CU FT		
	CO2	CH4	N2O	CO2	CH4	N2O
1,027	116.889	0.0020	0.0002	120.0451	0.0020	0.0002

GHG emission factors from CARB 2008, ARB Compendium of Emission Factors and Methods to Support Mandatory Reporting of Greenhouse Gas Emissions.

CRITERIA POLLUTANT EMISSIONS

POUNDS PER 1 MILLION STANDARD CUBIC FEET					
ROG	NOx	CO	SOx	PM10	PM2.5
5.5	94	40	0.6	7.6	7.6

NOx and CO emission rates based on residential furnace scale devices.

SOx emission rate based on sulfur content of 2,000 grains per million cubic feet.

Criteria pollutant emission rates from AP-42 Section 1.4

FUEL OIL GHG EMISSION FACTORS

2.20462260 pounds per kilogram

GHG EMISSIONS

FUEL TYPE	BTU PER GALLON	LBS PER GALLON			LBS PER MMBTU		
		CO2	CH4	N2O	CO2	CH4	N2O
CRUDE OIL	138,095	22.686	0.0009	0.0002	164.2748	0.0066	0.0013
DISTILLATE (# 1, 2, or 4)	138,690	22.355	0.0009	0.0002	161.1854	0.0066	0.0013
RESIDUAL (# 5 or 6)	149,690	25.993	0.0010	0.0002	173.6416	0.0066	0.0013
WASTE OIL	138,690	22.626	0.0092	0.0012	163.1421	0.0661	0.0088

GHG emission factors from CARB 2008, ARB Compendium of Emission Factors and Methods to Support Mandatory Reporting of Greenhouse Gas Emissions

Note: BTU content of waste oil based on "other oil" entry in Table 4 of CARB 2008.

Assume Residual Oil for petroleum fueled power plants.

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APPENDIX E – LAND USE

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NOTICE OF PROPOSED CONSTRUCTION OR ALTERATION

§77.13 Construction or alteration requiring notice.

(a) Except as provided in §77.15, each sponsor who proposes any of the following construction or alteration shall notify the Administrator in the form and manner prescribed in §77.17.

(1) Any construction or alteration of more than 200 feet in height above the ground level at its site.
(2) Any construction or alteration of greater height than imaginary surface extending outward and upward at one of the following slopes:
(i) 1 00 to 1 for horizontal distance of 20,000 feet from the nearest point of the nearest runway of each airport specified in paragraph (a)(5) or this section with at least one runway more than 3,200 feet in actual length, excluding heliports.
(ii) 50 to 1 for horizontal distance of 10,000 feet from the nearest point of the nearest runway of each airport specified in paragraph (a)(5) of this section with its longest runway no more than 3,200 feet in actual length, excluding heliports.
(iii) 25 to 1 for a horizontal distance of 5,000 feet from the nearest point of the nearest landing and takeoff area of each heliport specified in paragraph (a)(5) of this section.

(3) Any highway, railroad, or other traverse way for mobile objects, of a height which, if adjusted upward 17 feet for an Interstate Highway that is part of the National System of Military and Interstate Highways where overcrossings are designed for a minimum of 17 feet vertical distance, 16 feet for any other public roadway, 10 feet or the height of the highest mobile object that would normally traverse the road, whichever is greater, for a private road, 23 feet for a railroad, and for a waterway or any other traverse way not previously mentioned, an amount equal to the height of the highest mobile object that would normally traverse it, would exceed a standard of paragraph (a)(1) or (2) of this section.

(4) When requested by the FAA, any construction or alteration that would be in an instrument approach area (defined in the FAA standards governing instrument approach procedures) and available information indicates it might exceed a standard of Subpart C of this part.

(5) Any construction or alteration on any of the following airports (including heliports):
(i) An airport that is available for public use and is listed in the Airport Directory of the current Airman's Information Manual or in either the Alaska or Pacific Airman's Guide and Chart Supplement.
(ii) An airport under construction, that is the subject of a notice or proposal on file with the Federal Aviation Administration, and except for military airports, it is clearly indicated that airport will be available for public use.
(iii) An airport that is operated by an armed force of the United States.

(b) Each sponsor who proposes construction or alteration that is the subject of a notice under paragraph (a) of this section and is advised by an FAA regional office that a supplemental notice is required shall submit that notice on a prescribed form to be received by the FAA regional office at least 48 hours before the start of construction or alteration.

(c) Each sponsor who undertakes construction or alteration that is the subject of a notice under paragraph (a) of this section shall, within 5 days after that construction or alteration reaches its greatest height, submit a supplemental notice on a prescribed form to the FAA regional office having jurisdiction over the region involved, if –
(1) The construction or alteration is more than 200 feet above the surface level of its site; or
(2) An FAA regional office advises him that submission of the form is required.

§77.15 Construction or alteration not requiring notice.

No person is required to notify the Administrator for any of the following construction or alteration:
(a) Any object that would be shielded by existing structures of a permanent and substantial character or by natural terrain or topographic features of equal or greater height, and would be located in the congested area of a city, town, or settlement where it is evident beyond all reasonable doubt that the structure so shielded will not adversely affect safety in air navigation.
(b) Any antenna structure of 20 feet or less in height except one that would increase the height of another antenna structure.
(c) Any air navigation facility, airport visual approach or landing air, aircraft arresting device, or meteorological device, of a type approved by the Administrator, or an appropriate military service on military airports, the location and height of which is fixed by its functional purpose.
(d) Any construction or alteration for which notice is required by any other FAA regulation.

§77.17 Form and time of notice

(a) Each person who is required to notify the Administrator under §77.13 (a) shall send one executed form set of FAA Form 7460-1, Notice of Proposed Construction or Alteration, to the Manager, Air Traffic Division, FAA Regional Office having jurisdiction over the area within which the construction or alteration will be located. Copies of FAA Form 7460-1 may be obtained from the headquarters of the Federal Aviation Administration and the regional offices.

(b) The notice required under §77.13 (a)(1) through (4) must be submitted at least 30 days before the earlier of the following dates –
(1) The date the proposed construction or alteration is to begin.

(2) The date an application for a construction permit is to be filed.

However, a notice relating to proposed construction or alteration that is subject to the licensing requirements of the Federal Communications Act may be sent to the FAA at the same time the application for construction is filed with the Federal Communications Commission, or at any time before that filing.

(c) A proposed structure or an alteration to an existing structure that exceeds 2,000 feet in height above the ground will be presumed to be a hazard to air navigation and to result in an inefficient utilization of airspace and the applicant has the burden of overcoming that presumption. Each notice submitted under the pertinent provisions of this part 77 proposing a structure in excess of 2,000 feet above ground, or an alteration that will make an existing structure exceed that height, must contain a detailed showing, directed to meeting this burden. Only in exceptional cases, where the FAA concludes that a clear and compelling showing has been made that it would not result in an inefficient utilization of the airspace and would not result in a hazard to air navigation, will a determination of no hazard be issued.

(d) In the case of an emergency involving essential public services, public health, or public safety that required immediate construction or alteration, the 30 day requirement in paragraph (b) of this section does not apply and the notice may be sent by telephone, telegraph, or other expeditious means, with an executed FAA Form 7460-1 submitted within five (5) days thereafter. Outside normal business hours, emergency notices by telephone or telegraph may be submitted to the nearest FAA Flight Service Station.

(e) Each person who is required to notify the Administrator by paragraph (b) or (c) of §77.13, or both shall send an executed copy of FAA Form 7460-2, Notice of Actual Construction or Alteration, to the Manager, Air Traffic Division, FAA Regional Office having jurisdiction over the area involved.

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office Obstruction Evaluation Service, AJR-322
2601 Meachum Boulevard
Fort Worth, TX 76193
Fax: 817-838-1991
Phone: 817-838-1990

Website: https://oeaaa.faa.gov

INSTRUCTIONS FOR COMPLETING FAA FORM 7460-1

PLEASE TYPE or PRINT

ITEM #1. Please include the name, address and phone number of a personal contact point as well as the company name.

ITEM #2. Please include the name, address and phone number of a personal contact point as well as the company name.

ITEM #3. New Construction would be a structure that has not yet been built.

Alteration is a change to an existing structure such as the addition of a side mounted antenna, a change to the marking and lighting, a change to power and/or frequency, or a change to the height. The nature of the alteration shall be included in **ITEM #21** "Complete Description of Proposal".

Existing would be a correction to the latitude and/or longitude, a correction to the height, or if filing on an existing structure which has never been studied by the FAA. The reason for the notice shall be included in **ITEM #21** "Complete Description of Proposal".

ITEM #4. If Permanent, so indicate. If Temporary, such as a crane or drilling derrick, enter the estimated length of time the temporary structure will be up.

ITEM #5. Enter the date that construction is expected to start and the date that construction should be completed.

ITEM #6. Please indicate the type of structure. **DO NOT LEAVE BLANK.**

ITEM #7. In the event that obstruction marking and lighting is required, please indicate type desired. If no preference, check "other" and indicate "no preference" **DO NOT LEAVE BLANK.** ***NOTE:*** *High Intensity lighting shall be used only for structures over 500' AGL.* In the absence of high intensity lighting for structures over 500' AGL, marking is also required.

ITEM #8. If this is an existing tower that has been registered with the FCC, enter the FCC Antenna Structure Registration number here.

ITEM #9 and #10. Latitude and longitude must be geographic coordinates, accurate to within the nearest second or to the nearest hundredth of a second if known. Latitude and longitude derived solely from a **hand-held GPS instrument is NOT acceptable.** A hand-held GPS is only accurate to within 100 meters (328 *feet*) 95 percent of the time. This data, when plotted, should match the site depiction submitted under **ITEM #20.**

ITEM #11. NAD 83 is preferred; however, latitude and longitude may be submitted in NAD 27. Also, in some geographic areas where NAD 27 and NAD 83 are not available other datums may be used. It is important to know which datum is used. **DO NOT LEAVE BLANK.**

ITEM #12. Enter the name of the nearest city and state to the site. If the structure is or will be in a city, enter the name of that city and state.

ITEM #13. Enter the **full** name of the nearest public-use ***(not private-use)*** airport or heliport or military airport or heliport to the site.

ITEM #14. Enter the distance **from** the airport or heliport listed in **#13 to the structure.**

ITEM #15. Enter the direction **from** the airport or heliport listed in **#13 to the structure.**

ITEM #16. Enter the site elevation above mean sea level and expressed in whole feet rounded to the nearest foot (e.g. 17'3" rounds to 17', 17'6" rounds to 18'). This data should match the ground contour elevations for site depiction submitted under **ITEM #20.**

ITEM #17. Enter the total structure height **above ground level** in **whole feet** rounded to the **next highest foot** (e.g. 17'3" rounds to 18'). **The total structure height shall include anything mounted on top of the structure, such as antennas, obstruction lights, lightning rods, etc.**

ITEM #18. Enter the overall height above mean sea level and expressed in **whole feet.** This will be the total of **ITEM #16 + ITEM #17.**

ITEM #19. If an FAA aeronautical study was previously conducted, enter the previous study number.

ITEM #20. Enter the relationship of the structure to roads, airports, prominent terrain, existing structures, etc. Attach an 8-1/2" x 11" non-reduced copy of the appropriate 7.5 minute U.S. Geological Survey *(USGS)* Quadrangle Map MARKED WITH A PRECISE INDICATION OF THE SITE LOCATION. To obtain maps, contact USGC at 1-800-435-7627 or via internet at "http://mapping.usgs.gov". If available, attach a copy of a documented site survey with the surveyor's certification stating the amount of vertical and horizontal accuracy in feet.

ITEM #21.

- For transmitting stations, include maximum effective radiated power *(ERP)* and all frequencies.
- For antennas, include the type of antenna and center of radiation *(Attach the antenna pattern, if available).*
- For microwave, include azimuth relative to true north.
- For overhead wires or transmission lines, include size and configuration of wires and their supporting structures *(Attach depiction).*
- For **each** pole/support, include coordinates, site elevation, and structure height above ground level or water.
- For buildings, include site orientation, coordinates of **each** corner, dimensions, and construction materials.
- For alterations, explain the alteration thoroughly.
- For existing structures, thoroughly explain the reason for notifying the FAA *(e.g. corrections, no record or previous study, etc.).*

Filing this information with the FAA does not relieve the sponsor of this construction or alteration from complying with any other federal, state or local rules or regulations. If you are not sure what other rules or regulations apply to your proposal, contact local/state aviations and zoning authorities.

Paperwork Reduction Work Act Statement: This information is collected to evaluate the effect of proposed construction or alteration on air navigation and is not confidential. Providing this information is mandatory for anyone proposing construction or alteration that meets or exceeds the criteria contained in 14 CFR, part 77. We estimate that the burden of this collection is an average 19 minutes per response. An agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a currently valid OMB control number. The OMB control number for this collection is 2120-0001. Comments concerning the accuracy of this burden and suggestions for reducing the burden should be directed to the FAA at: 800 Independence Ave. SW, Washington, DC 20591, Attn: Information Collection Clearance Officer, ABA-20

Please Type or Print on This Form

Form Approved OMB No.2120-0001
Expiration Date: 9/30/2010

U.S. Department of Transportation
Federal Aviation Administration

Failure To Provide All Requested Information May Delay Processing of Your Notice

Notice of Proposed Construction or Alteration

FOR FAA USE ONLY
Aeronautical Study Number

1. Sponsor *(person, company, etc. proposing this action)*:
Attn. of: ______
Name: ______
Address: ______
______
City: ______ State: ______ Zip: ______
Telephone: ______ Fax: ______

2. Sponsor's Representative *(if other than #1)*:
Attn. of: ______
Name: ______
Address: ______
______
City: ______ State: ______ Zip: ______
Telephone: ______ Fax: ______

3. Notice of: ☐ New Construction ☐ Alteration ☐ Existing

4. Duration: ☐ Permanent ☐ Temporary (____ months, ____ days)

5. Work Schedule: Beginning ______ End ______

6. Type: ☐ Antenna Tower ☐ Crane ☐ Building ☐ Power Line ☐ Landfill ☐ Water Tank ☐ Other ______

7. Marking/Painting and/or Lighting Preferred:
☐ Red Lights and Paint ☐ Dual - Red and Medium Intensity White
☐ White - Medium Intensity ☐ Dual - Red and high Intensity White
☐ White - High Intensity ☐ Other

8. FCC Antenna Structure Registration Number *(if applicable)*:
______

9. Latitude: ____ ° ____ ' ____ . ____ "

10. Longitude: ____ ° ____ ' ____ . ____ "

11. Datum: ☐ NAD 83 ☐ NAD 27 ☐ Other

12. Nearest: City: ______ State ______

13. Nearest *Public-use* *(not private-use)* or Military Airport or Heliport:
______

14. Distance from #13. to Structure: ______

15. Direction from #13. to Structure: ______

16. Site Elevation *(AMSL)*: ______ ft.

17. Total Structure Height *(AGL)*: ______ ft.

18. Overall Height (#16 + #17) *(AMSL)*: ______ ft.

19. Previous FAA Aeronautical Study Number *(if applicable)*:
______-OE

20. Description of Location: *(Attach a USGS 7.5 minute Quadrangle Map with the precise site marked and any certified survey)*

21. Complete Description of Proposal:

Frequency/Power (kW)	

Notice is required by 14 Code of Federal Regulations, part 77 pursuant to 49 U.S.C., Section 44718. Persons who knowingly and willingly violate the notice requirements of part 77 are subject to a civil penalty of $1,000 per day until the notice is received, pursuant to 49 U.S.C., Section 46301(a)

I hereby certify that all of the above statements made by me are true, complete, and correct to the best of my knowledge. In addition, I agree to mark and/or light the structure in accordance with established marking & lighting standards as necessary.

Date	Typed or Printed Name and Title of Person Filing Notice	Signature

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APPENDIX F – ECONOMIC EVALUATION DATA

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11C. ECONOMIC ANALYSIS SECTION

Maintain Status Quo
Install PV Array by thrid party financer

11D. ECONOMIC JUSTIFICATION SUMMARY

Life-cycle Cost Analysis Data Base

1. Investment costs were developed Laughlin AFB personnel.

2. Life-Cycle costs were calculated using the National Institute of Standard and Technology Energy Price Indices and Discount Factors for Life-Cycle cost Analysis.

   a. Energy Savings Summary

Savings by using PV Array:	Life Cycle Cost	LifeCycle Savings (MWh)	Life Cycle Savings (MBtu)
Savings	$5.5M	61,592	210,159

   b. Net savings savings = $5,212,380
   c. Savings-to-Investment Ratio (SIR)= 105.25
   d. Adjusted Internal Rate of Return = 28.57%
   e. Simple Payback = 4
   f. Discounted Payback = 4

   g. Emissions Reduction Summary

Electricity	CO_2	SO_2	NO_x
Life-Cycle Reduction	54,520,361.28 kg	132,982.71 kg	114,428.16 kg

3. Energy Savings Calculations:

Due to the nature of this project, the MILCON Analysis with Alternatives method was used to caluclate Life Cycle Costs on the BLCC comparing our current electricity price with escalation to the price of a locked in electricty price with a small EIAP cost.

The Base case, what we do now, factors in no instatllation costs of any kind, but does account for the electricty consumption that would be produced by a PV Array here on base.

The alternative, what we would pay with a PV Array, accounts for the EIAP as the installation cost. It also, instead of putting the electricity used under the energy tab, accounts for the electricity produced by this renewable resource, purhased from a third party, under the annual O&M tab. This ensures that the emmission savings are calculated correctly, since the base case would be the only case that would produce emmisions, relatively speaking. This also accounts for the fixed rate payed every year for this chunk of the electricty used on base.

4. Closure Statement: This installation is not being considered for closure.

NIST BLCC 5.3-06: Comparative Analysis
Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: Current Utility Rate
Alternative: Rates with Solar

General Information
File Name: C:\Documents and Settings\amanda.smeeding\Desktop\projects\Laughlin

Projects\PV Array with Alternative.xml
Date of Study: Mon Feb 25 09:54:44 CST 2008
Project Name: MXDP 091023-PV Array
Project Location: Alabama
Analysis Type: MILCON Analysis, Energy Project
Analyst: AMS
Comment: Difference in current use with annual increase vs. renewable energy from PV Array at standard rate
Base Date: February 1, 2009
Beneficial Occupancy Date: February 1, 2010
Study Period: 21 years 0 months(February 1, 2009 through January 31, 2030)
Discount Rate: 3%
Discounting Convention: Mid-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

Initial Investment Costs:	Base Case	Alternative	Savings from Alternative
Capital Requirements as of Base Date	$0	$50,000	-$50,000
Future Costs:			
Energy Consumption Costs	$10,229,080	$0	$10,229,080
Energy Demand Charges	$0	$0	$0
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Routine Recurring and Non-Recurring OM&R Costs	$0	$4,966,701	-$4,966,701
Major Repair and Replacements	$0	$0	$0
Residual Value at End of Study Period	$0	$0	$0
	-------------	-------------	----------

Subtotal (for Future Cost Items)	$10,229,080	$4,966,701	$5,262,380
	------------	------------	------------
Total PV Life-Cycle Cost	$10,229,080	$5,016,701	$5,212,380

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	$5,262,380
- Increased Total Investment	$50,000

Net Savings	$5,212,380

Savings-to-Investment Ratio (SIR)

SIR = 105.25

Adjusted Internal Rate of Return

AIRR = 28.57%

Payback Period

Estimated Years to Payback (from beginning of Beneficial Occupancy Period)

Simple Payback occurs in year	4
Discounted Payback occurs in year	4

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy	-----Average Annual Consumption-----			Life-Cycle
Type	Base Case	Alternative	Savings	Savings
Electricity	3,080,000.0 kWh	0.0 kWh	3,080,000.0 kWh	61,591,567.4 kWh

Energy Savings Summary (in MBtu)

Energy	-----Average Annual Consumption-----			Life-Cycle
Type	Base Case	Alternative	Savings	Savings
Electricity	10,509.4 MBtu	0.0 MBtu	10,509.4 MBtu	210,159.1 MBtu

Emissions Reduction Summary

Energy	-----Average Annual Emissions-----			Life-Cycle
Type	Base Case	Alternative	Reduction	Reduction
Electricity				
CO2	2,726,391.29 kg	0.00 kg	2,726,391.29 kg	54,520,361.28 kg
SO2	6,650.05 kg	0.00 kg	6,650.05 kg	132,982.71 kg
NOx	5,722.19 kg	0.00 kg	5,722.19 kg	114,428.16 kg
Total:				
CO2	2,726,391.29 kg	0.00 kg	2,726,391.29 kg	54,520,361.28 kg
SO2	6,650.05 kg	0.00 kg	6,650.05 kg	132,982.71 kg
NOx	5,722.19 kg	0.00 kg	5,722.19 kg	114,428.16 kg

APPENDIX G – LAUGHLIN AFB GENERAL PLAN UPDATE

Laughlin Air Force Base, Texas

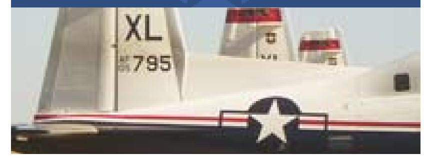
GENERAL PLAN UPDATE

Project Number MXDP090001 | 95% Submission

31 DECEMBER 2010

PBS&J

an Atkins company



31 DECEMBER 2010

GENERAL PLAN UPDATE

PREPARED FOR:

47th Flying Training Wing
Laughlin Air Force Base, Texas

MXDP090001 | 95% Submission

PREPARED BY:

PBS&J
an Atkins company

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CONTENTS

1.0 INTRODUCTION

2.0 PLAN FINDINGS AND RECOMMENDATIONS

FIGURES

TABLES

1

1.0 INTRODUCTION

Laughlin Air Force Base (AFB), similar to most military installations, operates like a small city. The base includes an array of land uses including industrial, administrative, commercial, housing, recreation, and open space. The installation also maintains an extensive and diverse circulation and infrastructure system, including an airfield.

Laughlin AFB is faced with a growing array of planning, operational, and engineering requirements and regulations evolving from constant changes in the local, federal, and global environments. The base must be prepared to manage on-base resources and meet new and changing requirements and regulations related to antiterrorism/force protection, funding, and Executive Orders 13327, 13423, and 13514.

47th Operations Group Building on the Flightline

Static Aircraft Display

1.1 GENERAL PLAN PURPOSE

The purpose of the General Plan is to promote informed, sound, and coordinated decisions regarding the future development of Laughlin AFB. A great deal of management skill and planning is necessary to make the base work as one seamless operation requires. The General Plan serves as a guide to anticipate the future and helps base personnel understand existing conditions, documents existing needs and future expectations, and provides programs and projects that can help the base fluidly respond to an ever-changing world. This General Plan will provide decision makers at the base, Headquarters Air Education and Training Command (AETC), Headquarters United States Air Force (HQ USAF), and local governments with essential information on the plans for the future of Laughlin AFB and the projects needed to make Laughlin AFB's vision a reality.

The Laughlin AFB General Plan was developed with the basic tenets of planning, which are listed below.

- **Physical**. The General Plan is a physical plan for the future of the base. It deals less with individual programs and the provision of services and more with the physical dimensions of the base, such as land, buildings and facilities, circulation, and utilities.
- **Comprehensive**. The General Plan should be comprehensive in nature, covering the range of natural and cultural resources, infrastructure, and land uses affecting the base. The General Plan is also comprehensive in geographic coverage, addressing not only the entire base's land area, but also the environment of adjacent lands outside the fence line.
- **Long-Range**. The General Plan looks beyond the five-year planning horizon of the Capital Improvements Program (CIP) in order to create a framework for future decision-making. The timeframe for this plan encompasses a 25-year planning horizon.
- **General**. Given the comprehensive and long-range nature of the plan, it is general in nature in order to provide a useful planning framework. The General Plan uses the information contained in detailed technical studies prepared by the base to create a cohesive plan for the base's physical development.
- **Guidance**. The General Plan provides policy direction upon which land use and facility programs at the installation will be based. For instance, future construction plans and programs for Laughlin AFB must follow the guidelines established in the General Plan, with any deviations approved by the Laughlin AFB Facilities Utilization Board.
- **It is Laughlin AFB's General Plan**. This General Plan was developed with extensive input from base leadership and technical specialists at the base. The goals, objectives, and programs developed are the result of this input.

The General Plan also provides the guiding framework upon which other plans at the base are developed. These special plans and studies are focused on specific topics (such as the Integrated Natural Resources Management Plan, the Cultural Resources Management Plan, and Infrastructure Master Plans) or specific geographic areas (such as Area Development Plans (ADPs)).

As presented, this General Plan meets the requirements specified in Air Force Instruction (AFI) 32-7062, Air Force Comprehensive Planning.

1.2 DESCRIPTION OF THE PLANNING PROCESS

The following five-step process was used to formulate the General Plan, which is derived from current and projected missions, existing conditions, and current plans.

- **Identification** of mission, goals, existing conditions, and requirements. This step was initiated during the project kickoff meeting and continued through the data collection, stakeholder interviews, the initial (15%) submittal, and the conceptual (35%) submittal.
- **Evaluation** of constraints, opportunities, and alternative solutions. This step followed completion of the identification step and a review of the data gathered. Additional information gathered and an in-depth analysis of the comments from subject matter experts, Air Force planning experts, and the project team were used to develop the plan.
- **Implementation** of preferred alternative. This step was accomplished incrementally, as the Laughlin AFB community planning staff and decision makers proceeded towards the vision provided in the General Plan for base development.
- **Maintenance** of the General Plan. This step should be accomplished on a continual basis during plan review and update. As new missions or projects are defined or as development is completed, the plan should be updated to remain current.
- **Solicitation and review** of feedback. This step should be continuous in the comprehensive planning process. Feedback should be encouraged and received from all levels of the decision-making process and subsequently considered for inclusion in the General Plan. As existing conditions and needs change over time, group commanders and staff with subject matter expertise should take an active role in helping to maintain an up-to-date plan.

The Laughlin AFB General Plan was developed in cooperation with key installation personnel and subject matter experts who contributed ideas and expertise to the overall effort.

The data for the Laughlin AFB General Plan was collected from existing documentation and interviews with key personnel, which included the Wing Commander, Mission Support Commander, group and squadron commanders, and functional experts. In addition, personnel from across the base were contacted for up-to-date information on the topics covered in the General Plan.

1.3 MISSION & VISION

The mission of the Air Force is "to fly, fight, and win... in air, space, and cyberspace." The Air Force vision is "to be a trusted and reliable Joint partner with our sister services known for integrity in all of our activities, including support of the Joint mission first and foremost. We will provide compelling air, space, and cyber capabilities for use by the Combatant Commanders (CCDR). We will excel as stewards of all Air Force resources in service to the American people, while providing precise and reliable Global Vigilance, Reach, and Power for the nation."

Supporting the Air Force mission is the Air Force Civil Engineer's mission "to provide, operate, maintain, and protect sustainable installations as weapon-system platforms through engineering and emergency response services across the full mission spectrum." The Air Force Civil Engineer vision is to lead DoD by providing global combat support and efficient, sustainable installations using transformational business practices and innovative technologies to enable the projection of global air, space, and cyber power.

T-6A (Texan II) Aircraft

T-38C (Talon) Aircraft

T-1A (Jayhawk) Aircraft

The mission of AETC is to "Develop America's Airmen Today… for Tomorrow." Based on this, the mission statement for the 47th Flying Training Wing (47 FTW), the host unit at Laughlin AFB, is as follows: "Graduate the world's best-trained pilots though TEAMWORK and INNOVATION." These missions reflect the base's vision to be a premier AETC installation and to provide unprecedented training to pilots of the United States Air Force, Air Force Reserve, Air National Guard, and allied nation air forces.

Flight training has been taking place at Laughlin since 1947. In accordance with the mission and vision, Laughlin AFB provides specialized undergraduate pilot training (SUPT) using the T-1A (Jayhawk), T-6A (Texan II), and the T-38C (Talon) jet trainers. Currently, 300 new pilots each year complete an intensive 52-week training course to earn their wings. The T-38C (Talon) aircraft support the Introduction to Fighter Fundamentals (IFF) mission, which is a follow-on course to SUPT and consists of basic fighter tactics and maneuvers prior to specific fighter training.

1.4 GOALS AND OBJECTIVES

From the mission and vision statements, the following goals and objectives were developed.

1.4.1 Environmental, Energy, Transportation and Economic Performance Management

Goals

- Develop sustainable installations by implementing asset management principles for built and natural assets.
- Identify opportunities for improvement for installation sustainability by identifying opportunities for energy and water conservation
- Incorporate sustainable features into the installation's buildings and practices, with the ultimate goal of LEED certification.
  - LEED Silver, 5% certification beginning FY09, 10% certification beginning FY10 (Agency Policy Letter SDD Mandates 31 July 2007).
  - January 2010 - ACC Policy letter requiring 100% GBCI certification at LEED Silver Level.
  - Follow new Air Force SDD policy letter to be released late summer of 2010.
- Strive to incorporate energy conservation into base-wide construction standards and project recommendations.
- Meet Joint and Air Force recapitalization benchmarks.
- Balance resources and risks to provide high-quality installation capabilities and to optimize lifecycle investment to support readiness.

Objectives

- Meet or exceed the requirements set forth in Executive Order 13514 (Federal Leadership in Environmental, Energy, and Economic Performance).
  - Reducing potable water consumption intensity 2% annually through fiscal year 2020, or 26% by the end of fiscal year 2020, relative to a fiscal year 2007 baseline.
  - Reducing agency industrial, landscaping, and agricultural water consumption 2% annually, or 20% by the end of fiscal year 2020, relative to a fiscal year 2010 baseline.
  - Implement high performance sustainable Federal building design, construction, operation and management, maintenance, and deconstruction by:

  - Ensuring all new Federal buildings, entering the design phase in 2020 or later, are designed to achieve zero net energy by 2030.
  - Ensuring all new construction, major renovations, or repair or alteration of Federal buildings comply with the Guiding Principles of Federal Leadership in High Performance and Sustainable Buildings
  - Ensuring at least 15% of existing agency buildings and leases (above 5,000 gross square feet) meet the Guiding Principles by fiscal year 2015 and that the agency makes annual progress towards 100% compliance across its building inventory.
  - Pursuing cost-effective, innovative strategies (e.g., highly-reflective and vegetated roofs) to minimize consumption of energy, water, and materials.
  - Managing existing building systems to reduce the consumption of energy, water, and materials, and identifying alternatives to renovation that reduce existing asset deferred maintenance costs.
  - When adding assets to agency building inventories, identifying opportunities to reduce associated environmental impacts.

- Meet or exceed requirements set forth in Executive Order 13423 (Strengthening Federal Environmental, Energy, and Transportation Management).
  - Improve energy efficiency and reduce greenhouse gas emissions of the agency through a reduction of energy intensity by 3% annually through the end of FY 2015, or 30% by the end of FY 2015, relative to the baseline of the agency's energy use in FY 2003.
  - Ensure that at least half of the statutorily-required renewable energy consumed by the agency in a fiscal year comes from renewable sources, and to the extent feasible, the agency implements renewable energy generation projects on agency property for agency use.
  - Beginning in FY 2008, reduce water consumption intensity, relative to the baseline of the agency's water consumption in FY 2007, through life-cycle cost-effective measures by 2% annually through the end of FY 2015 or 16% by the end of FY 2015.
  - Implement within the agency sustainable practices for energy efficiency, greenhouse emissions avoidance or reduction, petroleum products use reduction, and renewable energy, including bioenergy and water conservation.
- Develop efficient processes to maximize EUL return on investment through EUL-financed military construction (MILCON), sustainment, restoration and modernization, and base operations support services/projects to modernize AF installations.
- Continue ERA optimization with a focus on reducing cost to complete, accelerating site closure, and reducing tooth-to-tail expenses.
- Significantly reduce or stabilize utility cost.
- Evaluation of the efficiency of our utility distribution systems.
- Enhance portfolio management for sustainable installations.
- Provide cost reduction or savings through the execution of IESP Pillar 4, partnering with DOE to advertise potential savings, and centralizing the purchasing of natural gas.
- Improve current and future infrastructure energy efficiency and water conservation through improved processes and sustainable energy efficiency standards.
- Promote the development of renewable and alternative energy for use in facilities.
- Reduce reliance on fossil fuels to meet facility and non-tactical vehicle energy requirements.

1.4.2 Real Property Asset Management

Goals

- Locate, size, and configure defense installation assets to meet the required capabilities of military forces.
- Balance asset investments and associated risk.
- Gain space and utilization efficiencies for infrastructure.

Objectives

- Meet or exceed the requirements set forth in Executive Order 13514 (Federal Leadership in Environmental, Energy, and Economic Performance).
    - When adding assets to agency building inventories, identifying opportunities to:
        - Consolidate and eliminate existing assets.
        - Optimize the performance of portfolio property.
    - Ensuring rehabilitation of Federally-owned historic buildings utilizes best practices and technologies in retrofitting to promote long-term viability of the building.
- Meet or exceed the requirements set forth in Executive Order 13327 (Federal Real Property Asset Management).
    - Support the "20/20 by 2020 Initiative" to the maximum extent possible.
    - Reduce footprint by 20% by the year 2020.
    - Establish and maintain a single, comprehensive, and descriptive database of all real property under the custody and control of all executive branch agencies, except when otherwise required for reasons of national security.
- Institutionalize an asset management approach in day-to-day business practices.
- Develop and implement comprehensive asset management plans for the Civil Engineer through processes that identify strategic needs, business processes, metrics, information management, and decision support capabilities required to manage assets throughout their lifecycle.
- By 2020, reduce by 20 percent the amount of the Air Force physical plant that requires funds.
- Optimize natural infrastructure assets.
- Implement an investment planning process that optimizes and prioritizes all asset investments needed to deliver agreed upon common output levels of service in a cost-effective and sustainable way with the lowest level of risk.
- Integrate Asset Management and sustainable principles into 21st-century base comprehensive planning.
- Establish and maintain a single, comprehensive, and descriptive database of all real property under the custody and control of all executive branch agencies, except when otherwise required for reasons of national security. Preserve areas with access to the Flightline for uses that require this access.
- Build transparent capital improvement business principles that integrate Asset Management principles.
- Optimize the DoD's existing facility space to enhance operational efficiencies and warfighting effectiveness.

- Eliminate excess and obsolete facility inventories to reduce costs.
- Retain, restore, and acquire cost-effective, sustainable, energy efficient, and safe infrastructure that meets anticipated operational requirements over expected service life.
- Optimize Air Force facility space use by implementing applicable industry standards, processes, techniques, and tools.
- Optimize facility demolition decisions through implementation of a comprehensive program based on achieving maximum return on investment.
- Meet or exceed mandated reduction goals for current and future infrastructure through execution of IESP Pillars 1 and 2.

1.4.3 Quality of Life

Goals

- Enrich the quality of life for the Laughlin community both on- and off-base.
- Develop and care for Airmen and their families.
- Identify opportunities for improvement for installation “walkability” by reducing reliance on vehicles and helping to foster a culture of fitness
- Identify opportunities for improvement for installation recreation and community facility enhancement
- Assess and deliver installation capabilities needed to provide effective, safe, and environmentally sound living and working places in support of DoD missions.
- Sustain deployed and home station quality of service.
- Protect personnel, property, and mission capabilities through informed risk decisions at the appropriate level of leadership.

Objectives

- Provide adequate family housing and unaccompanied personnel housing to improve the quality of life of service members and their families.
- Restore contaminated property to a condition that is protective of human health and the environment and sustains mission capability.
- Implement roadway improvements to increase safety and reduce congestion.
- Provide a safe pedestrian environment on the base.

1.4.4 Installation Planning

Goals

- Continuously improve installation planning and operations by embracing best business practices and modern asset management techniques.
- Encourage an on-base development pattern that minimizes land-use conflicts, considers and identifies potential environmental risks, consolidates similar activities, and contributes to energy conservation and the efficient use of personnel and materials.
- Develop a cooperative land-use partnership with local governments to protect the base from off-base development encroachments.

Objectives

- Enhance and standardize the enterprise planning process.
- Develop guidance and tools to improve current and future infrastructure, energy, and water efficiency through the implementation of processes to include energy considerations in installation-level planning, publicize water-reduction methods, and streamline energy-related programming.
- Implement a strategic-basing planning process that provides an enterprise-wide look at strategic-basing decisions while enabling short-term execution and leverages/enhances planning capabilities at all levels (strategic, operational, and tactical).
- Actively engage local communities to discuss future plans at the installation.
- Work with local communities to maintain a current joint land use plan for the area to maximize land use compatibility.
- Implement the Laughlin AFB Architectural Compatibility Guide on all new construction.
- Maintain ADPs to reflect current and future plans for critical planning areas: Community Center, Campus Center, and Flightline.
- Utilize a "campus" design within the Campus Center that groups similar and supporting uses in a distinct area and provides a design that supports the campus development.
- Implement an enterprise-wide encroachment control program to mitigate the near-term, ongoing, and future threat to mission readiness and sustainability; effectively manage encroachment threats to the installation complex; and ultimately institutionalize encroachment prevention and management within AF strategy, policy, and programs.
- Implement sustainable processes for installation asset management.
- Develop and maintain partnerships with interested parties to enhance sustainability and natural resource conservation and improve the operation of installations.

1.4.5 Mission Support

Goals

- Modernize Air and Space inventories, organizations, and training.
- Ensure the appropriate operational and support facilities are provided and maintained in order to maximize the efficiency of Laughlin AFB's flight training mission.
- Optimize land use to maintain flexibility in the installation's ability to accommodate new or changing mission requirements.

Objectives

- Manage our land, water, and air resources to sustain installation capabilities for missions to satisfy readiness requirements.
- Provide capabilities assessment of DoD installations to perform their missions in support of warfighting readiness.
- Implement Antiterrorism/Force Protection (AT/FP) requirements of Unified Facilities Criteria (UFC) 4-010-01, DoD Minimum Antiterrorism Standards for Buildings to enhance entrance gates and on-base security.

2

2.0 PLAN FINDINGS AND RECOMMENDATIONS

This section summarizes the findings and recommendations that resulted from the analyses and evaluations conducted during the preparation of the General Plan. To ensure that good planning policies and principles are incorporated into the continuing operation and development of Laughlin AFB, the following findings should be considered and the recommendations executed as suggested. This will guide Laughlin AFB's future development. Figure 2-1 identifies the locations of recommended projects on Laughlin AFB.

2.1 INSTALLATION AND VICINITY PROFILES

This section addresses issues related to the installation mission, growth, and economic conditions of the Laughlin AFB and the surrounding community. Items affecting future development at Laughlin AFB are discussed in Section 2.3 Constraints and Opportunities.

2.1.1 Community Definition and Connectivity

Finding

- Although clusters of "activities" are present throughout the installation, Laughlin AFB lacks amenities to help shape and define the overall community.

Recommendation(s)

- In order to better define the community, create the overall notion of a "Town Center". This may be more representative than physical, such as a large "Hub" of activity at a major pedestrian crossroad significantly enhanced with vegetation and/or vertical visual elements (like a clock tower on a college campus, etc.).
- Enhancing the "Town Center" concept, create activity "Hubs" that will ideally be located in and around key community areas. The notion of "Town Center" and "Hubs" may be further enhanced with food kiosks/vending areas, seating areas, plazas (both covered and uncovered), and other community activities such as athletic fields, community centers, shopping experiences, and internet café-style establishments.
- Site furnishings and lighting play critical roles in adding definition to "Hubs" as well as becoming transitional elements when deployed along pedestrian/bicycle routes. A pallet of site furnishings should be developed for use in the "Town Center", the "Hubs", and along pedestrian/bicycle routes.

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FIGURE 2-1: Recommended Projects Overview Map

2.2 CONSTRAINTS AND OPPORTUNITIES

The constraints and opportunities component of the General Plan integrates natural and cultural resources information, environmental quality issues, and airspace operational and safety requirements. Those factors that have special development considerations or the potential to limit future development are highlighted in the following sections and discussed in more detail in the component plan overview.

2.2.1 Security

Finding

- Additional measures near the Flightline can be implemented to meet AT/FP requirements, control access, and provide a more secure buffer between the Flightline and other areas of the installation.

Recommendation(s)

- Develop a pedestrian boundary between First Area and Second Street to provide a controlled access separation between the Flightline and public areas.
- Develop consolidated Flightline POV parking lots that meet AT/FP standoff distance requirements and allow closure of existing lots that are not in compliance are recommended.
- Install a camera surveillance system for the Flightline to aid in securing controlled areas.

Finding

- Attractive, passive security measures can be taken to enhance the visual landscape of Laughlin AFB while meeting AT/FP requirements.

Recommendation(s)

- Install an adequate barrier system for Heritage Park to protect personnel and facilities, such as low walls of concrete planters that would complement and complete the existing barriers. Incorporate AT/FP requirements in the design of new facilities, including double laminated glass, HVAC units set above ground, and minimum vehicle standoff distances.

Finding

- Perimeter security can be further enhanced with the addition of camera surveillance systems.

Recommendation(s)

- Installation of security systems acquired through the Spiral 1 program including three Manned Portable Surveillance Target Acquisition Systems, three Perimeter Surveillance Radar Systems, and one Wide-angle Surveillance Thermal Imagery System. These systems should be connected to the Emergency Operations Center (EOC).

2.2.2 Fire Protection

Finding

- Aircraft Hangars - Buildings 52 and 53 lack sufficient fire suppression systems, and Hangar 2 also lacks a sufficient fire suppression system to adequately protect T-38C aircraft.

Recommendation(s)

- Aircraft Hangars - Buildings 52, 53, and Hangar 2 (Building 210) require installation of a high-expansion foam fire suppression system to protect Flightline assets and T-38C aircraft.

Finding

- AT/FP standoff distances hinder the fire department's ability to get close enough to facilities to effectively fight fires.

Recommendation(s)

- To address the negative impacts of AT/FP standoff distances on firefighting, construct sprinkler connections at street curbs or parking lot curbs. Include dry standpipe systems in all facilities. The curbside sprinkler connections will minimize the distance required to provide additional water supplies and line pressure to building sprinklers. Dry standpipe systems include curbside standpipes connected to hoses already located in each building. Similar to hose systems found in civilian hotels, this system allows firefighters to energize the water hoses already located in the building rather than moving large amounts of their own equipment to the scene.

Finding

- Several fire hydrants are in need of replacement.

Recommendation(s)

- Rather than repairing antiquated and inadequate equipment, install new fire hydrants as the need arises.

2.2.3 Landscape Architecture

Finding

- Large turf areas and scattered landscaping necessitate extensive irrigation and maintenance.

Recommendation(s)

- In order to meet Executive Order mandates and to be better stewards of natural resources, employ extensive xeriscape initiatives. In conjunction with the "Hub" concept, develop "ribbons" of green that serve as visual enhancements to key activity areas, pedestrian collection points, and pedestrian/bicycle linkage routes, as well as along key vehicular routes and significant vehicular intersections. Xeriscape will dominate common open space areas and areas that do not contribute to the overall visual environment of the installation.

- Limit irrigation to high impact areas. Water efficient irrigation systems should be installed to support the ribbons of green concept, at primary facility entrances, and small turf areas that serve functional purposes. Systems should utilize micro spray and/or drip technology and be controlled by a centralized computer that monitors soil moisture levels, ambient temperature, and relative humidity.

- Drought tolerant tree species, watered via drip irrigation systems, should be planted along main roadways, pedestrian/bicycle routes and nodes, and at key vehicular intersections. By selecting appropriate tree species and by planting them in strategic locations/zones, the resulting shade reduces solar gain on facilities, reduces the heat sink affect on pavement, and provides an improved environment for bicyclists and pedestrians. Trees also become vertical elements that define pedestrian travel and add significance to major vehicular intersections and pedestrian collection hubs.

- Utilize rock/aggregate material as a mulch and reduce unnecessary turf areas.

- Develop an Environmental Management Plan for Laughlin AFB's Golf Course. The U.S. Air Force Golf Course Environmental Management (GEM) program is a proactive Air Force Center for Environmental Excellence (AFCEE) initiative to foster a better understanding of the environmental challenges facing golf courses. AFI 32-7064 requires a GEM Plan as part of the Integrated Natural Resources Management Plan (INRMP).

2.3 INFRASTRUCTURE

The infrastructure component of the General Plan examines all utility supply and delivery systems, and provides a concise overview of their status and capacity to accommodate growth. Roadway and airfield pavements also are included in this component. Utility systems and pavement conditions that have special development considerations or the potential to limit future development are discussed in this section.

2.3.1 Water Supply System

Finding

- Large facilities at the far periphery of the base do not have adequate water supply for fire-fighting emergencies.

Recommendation(s)

- Evaluate the need for and consider constructing external water storage tanks at key locations to ensure the water needs are met for the fire protection of all facilities.

Finding

- The water supply system has known leaks.

Recommendation(s)

- Conduct a study to determine where leaks in the system are occurring and replace the appropriate pipes. Laughlin AFB should continue to pursue methods of potable water conservation whenever possible to comply with Executive Order mandates.

Finding

- Laughlin AFB's water supply system has dead-end supply lines, which affect water pressure and reliability.

Recommendation(s)

- To increase overall water distribution system efficiency and reliability, upgrade the water supply system to a true looped system and eliminate dead-end supply lines.
- Conduct a study to determine the feasibility and cost associated with installing a redundant water feed for increased reliability.

Finding

- Laughlin's irrigation system is outdated and inefficient.

Recommendation(s)

- Only irrigate the developed ribbons of green concept. Install a system designed to water xeriscape plant material.
- Initiate a study that evaluates the irrigation system on the golf course. Reported water consumption estimates that approximately 50% of the potable water utilized by Laughlin AFB irrigates the golf course.
- Use EPA WaterSense irrigation products and approved contractors.

2.3.2 Sanitary Sewer System

Finding

- An in-depth study was performed on the current sanitary sewer system, and inefficiencies were documented.

Recommendation(s)

- Move forward according to the findings from the recent sanitary sewer system study.
- Determine the feasibility of transitioning to a wastewater treatment system that will be a more appropriate solution to meet the base's needs.

2.3.3 Storm Water Drainage System

Finding

- Flooding due to the ground's slow absorption rate during heavy rains has been problematic along the south end of the aircraft parking apron, southeast of the runway. Repair and enclosure of the drainage ditch along Second Street is currently in progress.

Recommendation(s)

- Continue to move forward with plans for two additional projects: upgrading the drainage system in First Area and installing drainage system on the airfield.

2.3.4 Natural Gas System

Finding

- Not all facilities are metered for natural gas consumption.

Recommendation(s)

- Provide meters for all facilities in an attempt to identify solutions for meeting the Executive Order 13432.

2.3.5 Liquid Fuels

Finding

- Additional improvements and security measures should be instituted at the fuel farm area.

Recommendation(s)

- Install surveillance cameras and a remotely-activated gate at the fuel farm entrance to increase operational efficiencies and address security issues.
- Proposed for funding under the Defense Energy Support Center (DESC) Program are the following projects:
  - Install containment barriers
  - Demolish deactivated bulk fuel tanks
  - Repair the bulk fuels tank and bulk fuels containment
  - Construct an alternative fuels station

2.3.6 Electrical System and Backup Power

Finding

- Operational and aesthetic benefits can be realized by incorporating improvements to the electrical systems.

Recommendation(s)

- Initiate a project to provide commercial redundant electrical feed from Hwy 277 South. This would increase reliability throughout the base and allow Laughlin AFB to seamlessly support flying operations during electrical events.
- Move electrical lines underground as new projects are designed and implemented. An additional benefit of a Pole Away Program would include beautifying the base by eliminating or reducing electrical/utility poles and overhead utility lines.
- Incorporate underground utilities to the greatest extent possible during new construction and major repair projects.

Finding

- Laughlin AFB mission-related operations are affected by power outages and inefficient systems.

Recommendation(s)

- Initiate a project to provide commercial redundant electrical feed from Hwy 277 South. This would increase Laughlin's ability to continue mission performance in more facilities while waiting for repairs during power outages.
- Install a looped electrical feed to support the airfield controls for Laughlin AFB's airfield lighting.

2.3.7 Airfield Lighting

Finding

- The runway lights present an opportunity to realize energy savings, which would contribute to the compliance of Executive Order mandates for energy consumption reductions.

Recommendation(s)

- Replace the existing runway, taxiway, and parking apron lights with energy-efficient, long-life Light Emitting Diodes (LED) lighting. Current light bulb lifespans are measured in hundreds or thousands of hours. Lifespans for LED lights are advertised at 10 years. In addition to increased bulb lifespans, LED light bulbs use a fraction of the power used by current light bulbs.

2.3.8 Central Heating and Cooling

Finding

- Due to the semi-arid climate and extremely high temperatures, proactive maintenance and replacement of chillers is imperative to mission operations.

Recommendation(s)

- Replace chillers nearing or at the end of their lifespans to maintain optimal performance and facility support.

Finding

- Improvements are necessary for the EMCS to operate at its fullest capabilities. Laughlin AFB does not use fiber optics any longer; fiber optic trunks with fiber optics still exist on the installation but are not being used.

Recommendation(s)

- Fund a project to upgrade the entire EMCS LAN system by installing a redundant LAN loop to reduce the negative impacts of line breaks or interruptions.

2.3.9 Communications

Finding

- Communications infrastructure does not reach some outlying buildings.

Recommendation(s)

- Install ductwork and/or fiber/Cat 6 copper to outlying buildings that currently do not have service.

2.3.10 Voice

Finding

- The current facility has a cable vault that is at maximum capacity with no room for expansion, which prevents future growth.

Recommendation(s)

- Construct a new Dial Central Office to expand current capacity and allow for future growth of the base cable plant.

2.3.11 Base Pavements

Finding

- The desert climate and intense heat causes rapid pavement deterioration.

Recommendation(s)

- Protect base pavements from deterioration through proper preventive maintenance such as sealing roadways and parking lots.

2.3.12 Airfield Pavement

Finding

- Deteriorating airfield pavements present safety and operational constraints to the flying mission.

Recommendation(s)

- Conduct a pavement study and develop a plan for maintaining and/or replacing runway, taxiway, and aircraft parking apron pavements in conjunction with the current pavement projects.

2.3.13 Transportation

Finding

- Opportunities exist at Laughlin AFB for the expansion/creation of cohesive and dedicated pedestrian and bicycle transportation routes to connect the Campus Center with the Flightline and other primary installation functions. In addition, Laughlin AFB's leadership is considering prohibiting on-base students from driving to class, which would increase the need for pedestrian and bicycle paths between the dormitories and the Flightline.

Recommendation(s)

- In order to enhance the "Town Center/Hub" concept, establish a walking trail system to improve connectivity between installation nodes, and paint dedicated bicycle lanes into the current roadways. Pedestrian and bicycle routes will provide a visual and physical link between destinations. The overall vision is to utilize vertical elements and landscape vegetation to enhance key intersections, thus defining the nodes.
- Install additional bicycle racks throughout the installation, particularly at the dormitories and along the Flightline.

Finding

- Vehicular circulation and parking dominate the physical environment along Flightline facilities. Second Street and associated POV parking areas visually and physically separate Flightline facilities from the community side of the installation.

Recommendation(s)

- Physically and visually link Flightline facilities to the "Town Center" and supporting "Hub" nodes, utilizing opportunities to create Flightline "Hubs" that are linked via pedestrian/bicycle routes. Options may include:
  - Redeveloping a portion Second Street.
  - Reconfiguring existing parking areas along Second Street to allow visual and physical connections for pedestrians.
  - Initiating a parking capacity study to determine possible expansion of the parking lot along Second Street across from Buildings 211 and 215, replacing displaced parking spaces during development of the Town Center and Hubs.
  - Establishing landscape zones and/or architectural vertical elements to provide visual linkages.

2.3.14 Roof Systems

Finding

- The aircraft fuel system maintenance roof leaks onto new HVAC equipment in the new expansion area and in the bay.

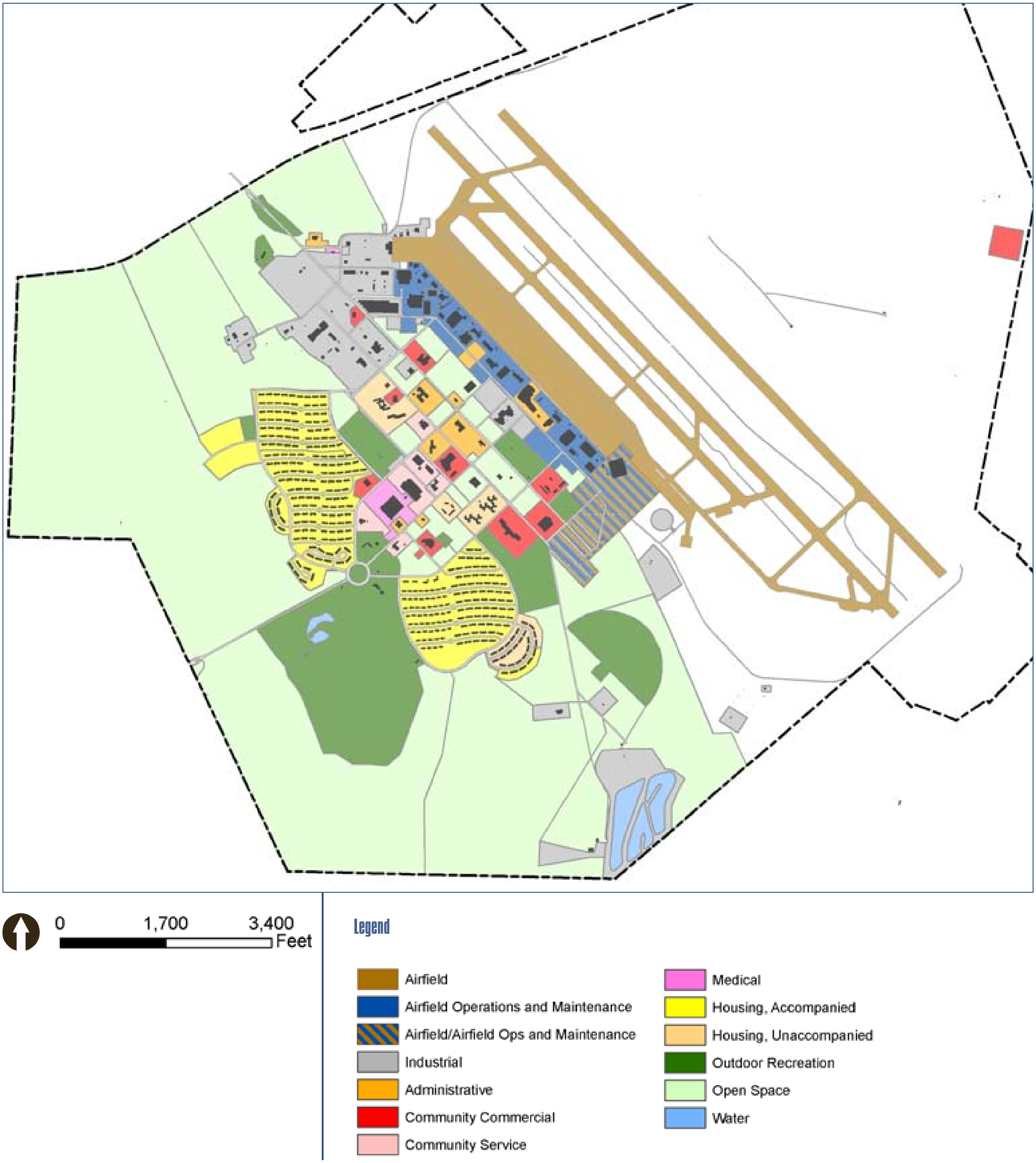
Recommendation(s)

- Repair or replace the aircraft fuel system maintenance roof.

2.4 LAND USE

Future development embodies the functional relationships and planning factors that influence land use compatibility on the installation. Information from plan elements, planned projects, and installation growth is evaluated, forming the basis for a land use plan that will guide future development at Laughlin AFB. Future land use for Laughlin AFB is graphically illustrated in Figure 2-2. As recommended in the Land Management Plan, all land management decisions should consider the protection of the existing Flightline, as well as land resources for future operational expansions in the event that mission changes require additional facilities and/or runways.

FIGURE 2-2 Future Land Use Map



2.4.1 Airfield

Finding

- At 8,858 LF, Laughlin AFB's longest runway is considered too short for such procedures and creates a safety concern.

Recommendation(s)

- Conduct a study to determine the feasibility of constructing a new 10,000 LF runway in the area northeast of the existing outside runway. Possible benefits of a new runway include:
  - Support of T-38C emergency take-off procedures (e.g., a single-engine take-off).
  - Elimination of the inside runway, which would eliminate the majority of airfield waivers.
  - The opportunity to slightly expand the existing parking apron.
  - New, shorter taxiing routes for T-38C aircraft. Because the T-38C has the smallest fuel tank of the aircraft at Laughlin AFB, any efficiencies gained from shorter taxiing routes would also result in fuel savings, contributing to Executive Order mandates for energy consumption reduction.

Finding

- An immediate need exists to relieve airfield congestion.

Recommendation(s)

- Relocate the threshold of the inside runway 1,500 feet south of its current location to address the aircraft congestion issues at intersection of Taxiways G/G-1 and A. Movement of the inside runway's threshold will provide appropriate clearance to allow aircraft to move between runways without having to wait for other aircraft to take-off or pass overhead during landings. Movement of the northern threshold necessitates a simultaneous move of Taxiway G-1 and the southern threshold southward to maintain the current inside runway length of 6,236 LF.

Finding

- Space should be preserved for the potential use in support of mission changes.

Recommendation(s)

- Reclassify the undeveloped land between the outside runway and the northeast base boundary from Airfield to Open Space land use category.

Finding

- Aircraft parking space is limited, and wingtip clearances are currently at the minimum distances required.

Recommendation(s)

- Fund the necessary projects to achieve improved aircraft parking in accordance with the Flightline ADP.

2.4.2 Aircraft Operations and Maintenance

Finding

- Existing land use adjacent to the Flightline and the location and orientation of the Weather Shelter restrict contiguous, future expansion of Flightline ramp and facilities.

Recommendation(s)

- In order to create potential expansion areas for Flightline associated functions, explore opportunities to relocate the existing Family Campground (FAMCamp), relocate the existing athletic fields and tennis courts, and examine the potential to redefine vehicular circulation in the immediate area.
- Demolish existing weather shelter and construct a new weather shelter near the intersection of Second Street and Arnold Boulevard. By relocating the weather shelter function, contiguous ramp area can be added that is within the sight line of the control tower.
- Relocate FAMCamp to the area between the Visitors Quarters and privatized housing, conveniently located near laundry facilities. By relocating the weather shelter and the FAMCamp function, additional ramp space can be constructed at a 90 degree angle to the existing aircraft parking apron. Additional opportunities would exist for additional aircraft parking and supporting Flightline facilities.

Finding

- Space to park and service Aerospace Ground Equipment (AGE) near the AGE maintenance shop is inefficient. The AGE is parked in various locations around the hangar/flight line apron areas, which adds to the overall congestion of the Flightline and reduces AGE maintenance efficiency. In addition, an area to wash AGE does not exist.

Recommendation(s)

- Construct a consolidated AGE parking, washing, and servicing area.

Finding

- The current J85 Engine Repair Shop in Hangar 2 is too small to accommodate the assigned personnel, perform engine maintenance, store serviceable spare engines, and associated support equipment.

Recommendation(s)

- Modify Hangar 1 to accommodate a J85 Engine Repair Shop.

Finding

- Both flight shack facilities are too small to accommodate the numbers of T-1 and T-6 aircraft that the technicians are assigned, plus store tools and aircraft protective equipment.

Recommendation(s)

- Extend Flight Shacks (Buildings 216 and 405).

Finding

- IAW 29 CFR 1910.1026, Chromium VI, a change room with washing facilities is required to prevent cross contamination and remove chromium from the skin.

Recommendation(s)

- Add a change room and washing capability to Building 58.

Finding

- Additional munitions storage space is required because new ejection seats have increased munitions workload and munitions items by 66% per T-6 aircraft and 44% per T-38 aircraft from the previous ejection systems.

Recommendation(s)

- Construct an addition to the munitions maintenance/inspection bay (Building 905) if all safety requirements could be met.

Finding

- Paved surfaces are preferred for vehicles transporting munitions.

Recommendation(s)

- Pave the parking lot.

Finding

- Controlled area lacks security fencing.

Recommendation(s)

- Add security fencing to enclose the controlled area.

Finding

- The aircraft fuel system maintenance roof leaks onto new HVAC equipment in the new expansion area and in the bay.

Recommendation(s)

- Repair or replace the roof.

Finding

- Available land located adjacent to the Flightline is valuable and should be preserved for facilities and uses essential to mission accomplishment.

Recommendation(s)

- Limit construction along the Flightline space to mission-essential facilities only.

Finding

- The severe temperatures and weather events cause considerable damage to aircraft on the parking apron.

Recommendation(s)

- Install Protective Aircraft Canopy Shelters (PACS) in accordance with the Flightline ADP.

2.4.3 Industrial

Finding

- Industrial development should not encroach on incompatible land uses.

Recommendation(s)

- Restrict industrial development and limit it to the industrial area's current footprint to preserve Open Space and avoid encroachment on incompatible land uses.

Finding

- The Aerospace Physiology facility is classified as an industrial land use. Aerospace Physiology conducts flight training classes and is located a considerable distance from the Flightline.

Recommendation(s)

- Redesignate the Aerospace Physiology facility and the Parachute Swing Trainer as Administrative land use.
- Remove the Aerospace Physiology Training Facility and Parachute Swing Trainer from the Community Center area and construct a new facility in the Campus Center footprint. This will contribute to establishing the Laughlin AFB Campus Center while locating Aerospace Physiology close to the Flightline.

2.4.4 Administrative

Finding

- The flow of Laughlin AFB could be improved with strategically-placed administrative functions and the preservation of land for related facilities.

Recommendation(s)

- Designate and preserve locations for the relocation of remotely located or proposed flying training facilities (formerly industrial land use) within the Campus Center. This will serve to consolidate similar functions into one area, making the Campus Center vision a reality.
- Cluster functionally-related facilities and land uses as described in the Campus Quad in the Campus Center ADP. Siting of new facilities should take into consideration the proper functional/land use relationship guidance provided by the Air Force.
- Construct a new Consolidated Club to replace the two existing club buildings (Club XL and Club Amistad). The opportunity exists to locate this new facility adjacent to the Leaning Pine Golf Course along Laughlin Drive, which will provide patrons appealing and relaxing views of the golf course greens. Consolidating the club system on Laughlin AFB will provide economies of scale and potential cost savings.

2.4.5 Community Commercial

Finding

- The small population at Laughlin AFB can not support a full-time food vendor or restaurant; however, on-base dining options are needed.

Recommendation(s)

- Solicit local caterers and/or restaurants to set up food stands in the activity "Hubs" in order to provide nutritious, convenient, and competitively-priced meals for the Laughlin AFB population during peak dining hours. Vendors could be on staggered schedules in order to provide variety.

2.4.6 Community Service

Finding

- Laughlin has experienced an increase in families due to the FY08 BRAC mission increase.

Recommendation(s)

- Add space to the Child Development Center as required to accommodate the increase in family members associated with the FY08 BRAC mission increase.
- Construct an indoor basketball court in the Youth Center to mitigate the harsh desert type conditions experienced by the base.

2.4.7 Medical

Finding

- Because it is no longer a hospital, the Medical Clinic is not authorized for emergency power generators.

Recommendation(s)

- As stated in the Electrical Systems recommendations, fund a project for a commercial redundant electrical feed from Hwy 277 South.
- As a possible interim solution, provide the Medical Clinic with a generator cart/power cart from the wing inventory, with the following criteria:
  - The Medical Group receives a high enough priority to ensure a cart is available even if all base facilities are without power.
  - A cart is in place and operational within one hour after power loss, unless power restoration can be assured prior to three hours of total loss.

2.4.8 Residential

Finding

- Dormitory space for student officers and enlisted personnel is inadequate and in need of replacement.

Recommendation(s)

- Construct the Student Officer Quarters, Phase 2 in the vicinity of the existing officer dormitories to house student officers currently assigned to Laughlin AFB and address current shortages in dormitory space.
- Construct a 96-person Enlisted Dormitory in the vicinity of the current Enlisted Dormitories to remedy current enlisted billeting deficiencies.

2.4.9 Outdoor Recreation

Finding

- The number of existing athletic fields, tennis courts, and ball fields may not be sufficient to support current/future population needs and, in some cases, may be poorly located to serve the targeted population.

Recommendation(s)

- Athletic fields should be "clustered" near the population(s) that they support in order to gain land use efficiencies and provide convenience for the users. The proposed location(s) for athletic fields is depicted in Figures 2-1 and 4-20.

2.5 CAPITAL IMPROVEMENTS PROGRAM

Laughlin AFB's Capital Improvements Program identifies the construction projects necessary to repair, upgrade, or replace the facilities and infrastructure that support its assigned missions. Continuing to identify and prioritize the projects is necessary to sustain Laughlin AFB and ensure its facilities and infrastructure are adequate to the 47th FTW's mission. Table 2-1 shows the MILCON projects currently on schedule for Laughlin AFB.

TABLE 2-1 Current MILCON Projects

Priority	Project Number	Title	Building(s)
1	103000	128 PN Enlisted Dorm	B255-256 (Dormitories) B245 (Troop Warehouse) 253 (Jack's)
2	133002A	Airfield Drainage	N/A
3	993002P2	Student Officers Quarters, Ph 2	B460-463 (Old TLFs) B9200-9220 (UOQ Duplexes)
4	070317	Small Arms Range	B1100 (Current Range)
5	103001	Aerospace Physiology	B380 (Current Aerospace Physiology) Possibly B239 (FTAC)
6	083002C	Community Event Complex (APF)	B235 (Fiesta Center) B485 (Tweety Bird Field/ Press Box)
7	063000	Add/alter Base Chapel	B351 (Theater)
8	153000	Upgrade Main Gate	N/A
9	163000	Upgrade West Gate	N/A
10	103002	Construct Comm Facility	B348 (Comm.) Associated Demolition

2.6 ASSET MANAGEMENT

The Air Force is transforming management of infrastructure assets and business process improvements through the Civil Engineer Enterprise Transformation Initiative. This transformation is in response to budget pressures associated with the need to modernize an aging aircraft fleet while continuing to fight the Global War on Terrorism. The Air Force Civil Engineer (CE) has aggressively undertaken a transformation to meet Defense and Air Force priorities of winning today's fight, taking care of its people, and preparing for tomorrow's challenges while becoming more efficient and cost effective.

This transformation modernizes and streamlines business processes to achieve a more efficient enterprise organization to support the larger Air Force mission. The CE community has developed and published an Air Force CE Strategic Plan and has kicked-off a broad range of process improvement initiatives across the enterprise.

One of the prime initiatives is adopting an Asset Management approach to installation management business processes to maximize the value and function of the Air Force's natural and built infrastructure. Asset Management is a structured approach to managing Air Force assets based on standardizing levels of service and balancing cost, risk, and benefits. Asset Management enables the Air Force to mitigate risk and cost to enable sound decision making in infrastructure management.

Asset Management is in response to Executive Order 13327, Federal Real Property Asset Management. This requires development of Asset Management Plans, establishment of appropriate performance measures, and an understanding of lifecycle costs of the inventory.

As part of the transformation to an asset management culture, Air Force installations are required to develop Activity Management Plans (AMPs) that include all built and natural infrastructure assets owned by the installation. The activities management plans are aligned into five broad categories: facilities, utilities, transportation networks and airfield pavements, natural infrastructure, and solid/hazardous waste management. These AMPs also include: managed airspace, easements and right-of-ways, in and out grants, mineral rights, leased land, and waterways.

2.6.1 Asset Management Purpose

The intent of transforming to Asset Management is to create a culture that:

- Integrates functional stovepipes using a holistic portfolio approach
- Strengthens resource advocacy by analyzing and articulating the best business case, based on risk and cost/benefits
- Optimizes resource allocation through standardized, transparent management processes and levels of service

An enterprise perspective using standard levels of service across all bases will enable and ensure costs are visible and impacts are clear. Commanders are able to clearly articulate requirements using a best business case process based on risk in order to establish funding hierarchy, as well as categorize requirements to maintain and sustain the mission.

The Activity Management Plans are developed to a FYDP+2 and built to a 10-year program. Upon the completion of the Five Activity Management Plans (Facilities, Utilities, Transportation, Natural Infrastructure, Waste Management), plans are consolidated into one Base Comprehensive Asset Management Plan (BCAMP). Eventually this plan rolls into the MAJCOM Comprehensive Asset Management Plan, and then finally is incorporated into the Air Force Comprehensive Asset Management Plan. The BCAMP is a standardized, institutionalized process that rolls up all "data" from the AMPs and creates "information" for use in decision-making. The BCAMP provides the ability to distribute resource investments across the five CE activities while applying risk management to meet prescribed levels of service. Ultimately, it links levels of service to funding.

Other Influences

Other initiatives that also influence prioritization within the BCAMP include such items as the Mission Dependence Index and Facility Condition Index. These are based on category codes and condition prioritizing assets to mission criticality. Mission commanders have the ability to influence project prioritization based on overall mission-related impact. The installation facilities board process will then evaluate the BCAMP project score/rank and approve the program to be submitted to MAJCOM.

Comprehensive Planning

Traditionally, a capital improvements plan, as identified by the General Plan, is established through short-range and long-range planning. The General Plan is a decision tool for the Installation Commander, and generally provides an overview of various components. The Installation Master Plan provides direction and guidance to the BCAMP for mid- to long-range facility and infrastructure requirements. Existing facility and infrastructure data resides in the Activity Management Plans (SRM, MILCON, and AFRIMS).

Activity Management Plans overlap and cut across multiple planning areas, including long- and short-range planning, for a cohesive integrated plan. By mapping General Plan requirements to specific Activity Management Plans as well as their associated levels of service and related levels of risk, decision makers have the ability to conduct business at the appropriate point required to sustain and maintain mission requirements.

2.6.2 Base Comprehensive Asset Management Plan

Future and Current Planning Integration

The Base Comprehensive Activity Management Plan is the single authoritative planning document for installation leadership and planners. The BCAMP provides the integration of future requirements and current planning into a single cohesive document to guide installation development and investment decisions.

BCAMP Overview

Future development requirements of an installation currently reside in the installation General Plan. General Plans are designed to provide the commander a summary of information from the installation's comprehensive planning framework.

As the Asset Management process progresses the BCAMP (from an enterprise perspective,) it will allow the Air Force to understand: the immediate, forecasted, and long-range requirements of an installation; where to assume and mitigate risk; the value of an asset based on a life-cycle or level of service analysis; and streamline the funding process.

2.7 IMPLEMENTATION

The General Plan supports the 47 FTWs vision for Laughlin AFB in the area of facilities planning and development. It is therefore critical that the General Plan be updated as the Wing's vision is modified over time. In order to ensure the greatest benefit of the General Plan, it is vital that the Wing Commander not only understands the importance of the plan but also endorses it. The Base Civil Engineer will implement the General Plan by following two primary strategies:

- Convey the intent and importance of the General Plan to senior base leadership.
- Optimize the existing processes for investing in construction, demolition, upgrading, and maintenance of real property.

Conveying the General Plan's importance and intent should begin within the 47th Civil Engineer Squadron (47 CES) and spread to other organizations within the 47th FTW, major tenants, and off-base organizations. Several organizations at Laughlin AFB contributed to the preparation of the General Plan, but implementation of this plan requires the support and resources of many people. To that end, Laughlin AFB's community planners should:

- Accompany distribution of the final General Plan report with formal or informal briefings by 47th CES personnel.
- Actively seek suggestions for improvement and incorporate these ideas into annual updates of the document.

The existing processes for base development include normal 47th CES mission activities and the functions of the Facilities Board. To optimize their effectiveness:

- Monitor the Capital Improvements Program by: coordinating the various funding sources and priorities, preparing budgets for new projects that advance the General Plan, and preparing phasing plans.
- Review construction, renovation, demolition, and maintenance programs and projects, in addition to management of natural infrastructure, to identify how they can advance long-range plans.

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3

3.0 INSTALLATION AND VICINITY PROFILE

This chapter describes Laughlin AFB and the adjacent environment. An understanding of the history, organization, and interaction of Laughlin AFB with the surrounding area is necessary when planning and implementing future development projects.

3.1 INSTALLATION PROFILE

3.1.1 Location

Laughlin AFB is located on 5,351 acres in Val Verde County within the Rio Grande River Valley Region of southwest Texas (Figure 3-1). Laughlin AFB sits adjacent to the south side of United States Highway 90 (US 90), about 150 miles west of San Antonio, the closest metropolitan center. Laughlin AFB's location offers student pilots wide open spaces and large unconstrained airspace. This, combined with excellent weather in the region, provides an outstanding location to conduct aircraft training operations.

3.1.2 History

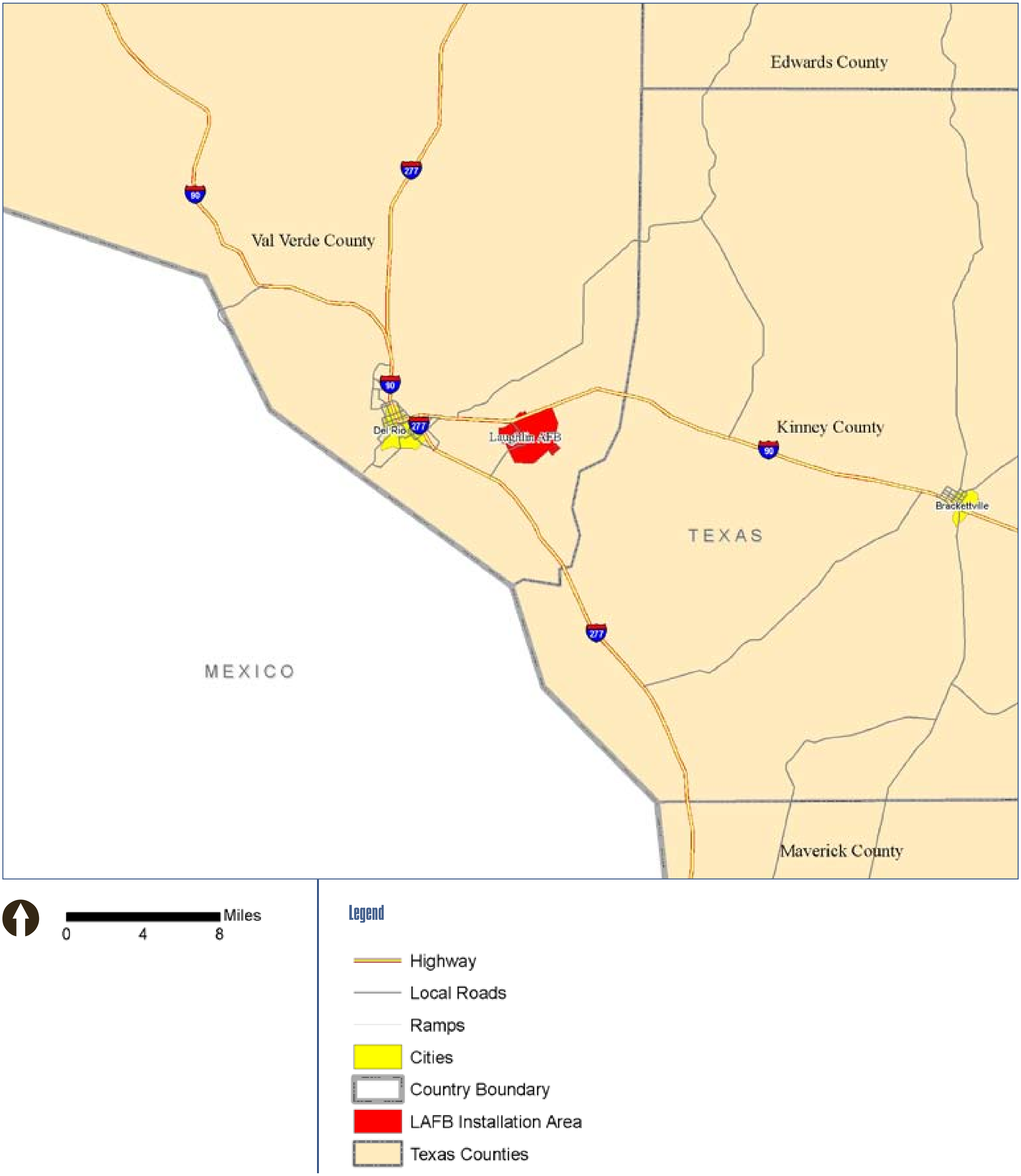
The first recorded western settlement of the area near Laughlin AFB dates back to the Spanish in 1635. However, archeological sites around Val Verde County have been dated as far back as 10,000 years. Permanent settlement of the area came with a US Army outpost in the 1850s. The Del Rio Post Office was established in 1883. By that time, the town was an established stop on well-used transportation routes between Texas and Mexico.

In 1942, with the advent of World War II, Laughlin Field was established just outside of Del Rio as a training base for the Martin B-26 Bomber. The airfield was named after 2nd Lieutenant (Lt) Jack Thomas Laughlin, a Del Rio native killed over Java in the South Pacific in the early days of the war. Following the conclusion of World War II, Laughlin Field was closed in 1947. By the mid-1950s, the Korean Conflict was underway and Laughlin Field was improved and reopened as Laughlin AFB. Once again the primary base mission was flying training.

Due to its remote location, the secret Strategic Reconnaissance Program was assigned to Laughlin AFB in the 1950s. In 1957, the top secret U-2 reconnaissance aircraft was introduced to the base and began flying high altitude reconnaissance operations over then communist countries. In 1962, the 4080th Strategic Reconnaissance Wing operating out of Laughlin AFB was credited with obtaining the first pictures of the Soviet missile build up in Cuba. The reconnaissance program was moved to Davis-Monthan AFB a year later.

In 1963, Laughlin AFB was transferred to the Air Training Command and has had the sole mission of undergraduate pilot training since that time. Over the last 43 years, over 12,000 Air Force pilots have been trained at Laughlin AFB. In July 1993, the 47th Flying Training Wing realigned under the newly designated AETC, headquartered out of Randolph AFB in San Antonio, Texas. With this transition came the implementation of the Student Undergraduate Pilot Training (SUPT) program, which, for the first time, addressed both primary flying training and specific advanced track training to better prepare students for their future roles in the USAF.

FIGURE 3-1 Installation Location Map



3.1.3 Installation Organizations

47th Flying Training Wing (47 FTW)

The 47 FTW is the host unit on Laughlin AFB. The 47 FTW is primarily responsible for training USAF, Air Force Reserve, Air National Guard, and allied nation military pilots under the SUPT program. To accomplish this mission, the 47 FTW must ensure the viability of Laughlin AFB as a whole.

The 47 FTW consists of four subordinate units: Mission Support Group, Operations Group, a civilian Maintenance Directorate, and Medical Group. The organization chart (Figure 3-2) illustrates the organization of the major units on Laughlin AFB. The following are brief descriptions of each major unit.

47th Mission Support Group (47 MSG)

The 47 MSG controls daily installation operations and ensures the provision of base services in support of the installation. The group supports the needs of more than 7,800 people living and working on the base. Base support activities managed by the group include military and civilian personnel management, administrative services, security and resource protection, disaster preparedness, recreational activities, family and transient housing, airmen dormitories, and dining facilities. In addition to these activities, the 47 MSG ensures the upkeep of all base infrastructure, implementation of environmental protection and energy conservation programs, and maintenance of the base communication systems.

47th Operations Group (47 OG)

The mission of the 47 OG is to conduct the SUPT program for all components of the USAF and the air forces of allied nations. As part of the SUPT program, new pilots complete primary flying training then move on to specialized advanced training in one of four tracks: fighter-bomber, airlift-tanker, turbo-prop aircraft, or helicopters. The T-6A (Texan II), T-38C (Talon), and T-1A (Jayhawk) are all used by the flying training squadrons of the 47 OG to conduct flying training operations. In addition to flight training operations, more than 500 hours of classroom time and 60 hours of simulator time are required to complete the intense 52-week SUPT program.

The 47 OG is responsible not only for flying training operations but also airfield management on Laughlin AFB. The group provides standardization and evaluation, management, and control in each of these areas of responsibility.

47th Maintenance Directorate

The 47 Maintenance Directorate was activated in August 2002. Originally designated Laughlin Civil Service Aircraft Maintenance (LCSAM), it came into being as the result of winning an A-76 bid in 1988. At that time, it was the first and only all civil service aircraft maintenance organization. LCSAM has gone through two organizational changes since 1988, resulting in its current status as a directorate (group equivalent). The 47 Maintenance Directorate represents a composite of civil service, military, and contract technicians committed to supporting the pilot training program.

In 1994, Laughlin AFB was chosen to be the site of the civilian contractors responsible for operating the Engine Regional Repair Center. The center performs depot level repairs on over 1,000 J-85 aircraft engines from Randolph AFB, Sheppard AFB, Vance AFB, and Laughlin AFB each year.

47th Medical Group (47 MDG)

The 47 MDG provides direct medical support to all eligible beneficiaries. The first Laughlin AFB hospital opened in January 1955. In October 1996, inpatient services closed, and the hospital became a clinic. Emergency services and most inpatient care are provided through TRICARE agreements with the local civilian healthcare system. Specialty care not available in the local healthcare system is available in the greater San Antonio metropolitan area. This includes the 59th Medical Wing at Wilford Hall Medical Center located on Lackland AFB.

The group's mission is to promote and ensure wellness in the community and to provide state-of-the-art healthcare. The 47 MDG readiness missions support global air expeditionary force operations and a wide range of local contingencies to include weapons of mass destruction and natural disasters.

Major Tenants

The 47 FTW is host to a number of tenants. The major tenants on Laughlin AFB include:

- Air Force Office of Special Investigations (AFOSI)
- American Red Cross
- Army and Air Force Exchange Service (AAFES) (Base Exchange and Shoppette)
- Defense Commissary Agency (DECA)
- Defense Reutilization Marketing Office (DRMO)
- United States Army Corps of Engineers (USACE)
- United States Postal Service (USPS)

3.1.4 Base Population

Laughlin AFB plays a major role in the local Del Rio economy. In addition to employee payrolls, Laughlin AFB contributes to the economy through local operation expenditures and construction contracts. The base is the largest employer in the region with an employee base of over 1,900 civilian employees and over 1,600 military personnel. Table 3-1 shows the details of the base population.

TABLE 3-1 Base Population

Category	Number of Personnel
Active Duty	838
Student Pilots	644
Department of Defense (DoD) Civilians	980
Non-Appropriated Funds (NAF)/Contractors	621
TOTAL	**3,083**

Source: Laughlin AFB NCOIC, Manpower and Organization, December 2010

3.1.5 Physical Assets

Laughlin AFB and its remote locations encompass 5,351 acres of land. Table 3-2 shows the breakdown of land, facilities, and buildings at each site.

Laughlin AFB has three runways: primary (center – 13C/31C) (8,858 LF), outside (13L/31R) (8,310 LF), and inside (13R/31L) (6,246 LF). A fourth Runway (4,000 LF) is located at Spofford Auxiliary Field.

FIGURE 3-2 Organization Chart

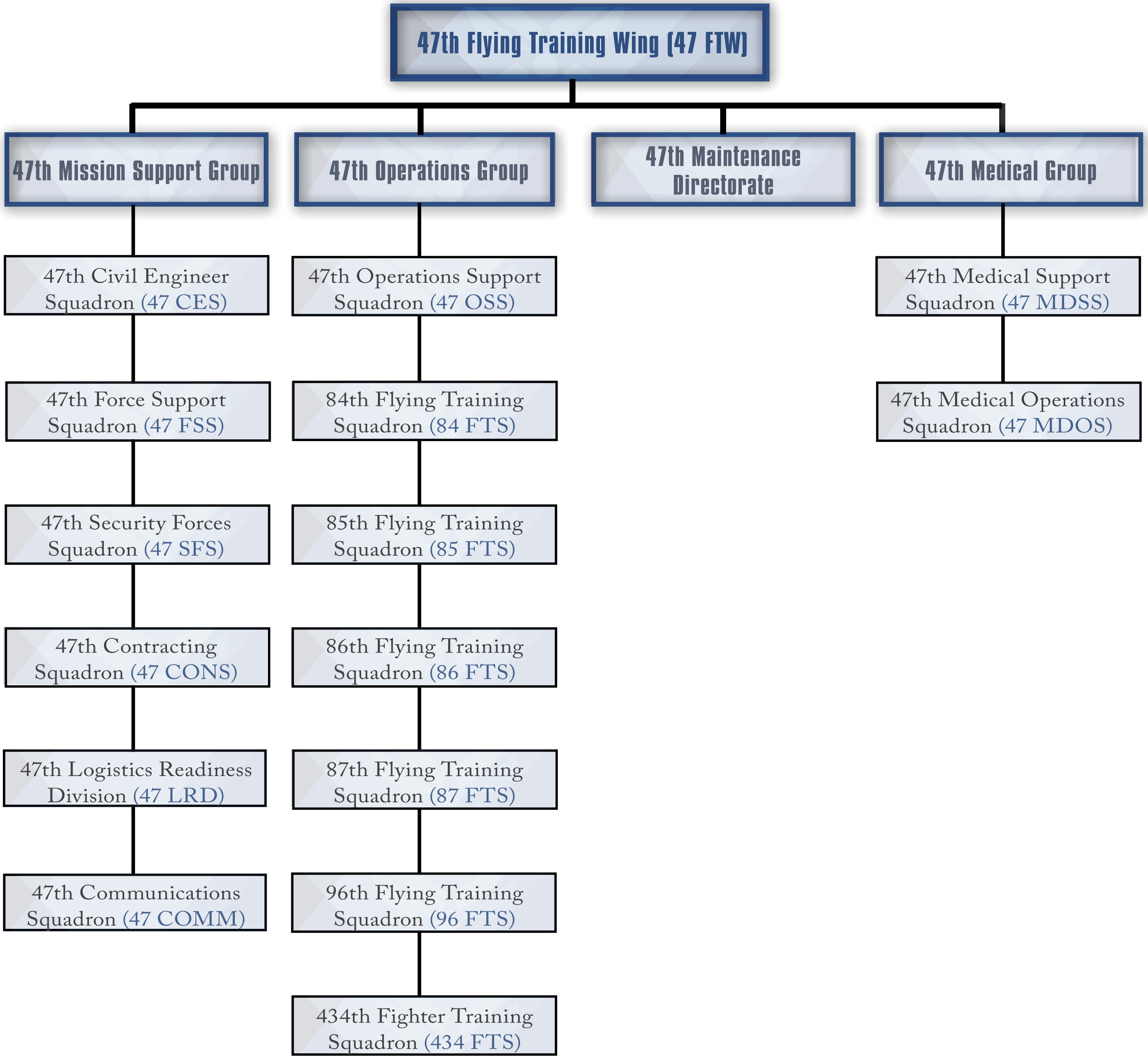


TABLE 3-2 Physical Assets

Installation Code	Installation Description	Acres	Facilities	Buildings	Square Feet (SF)
MXDP	Laughlin Proper	4,355.43	522	224	2,029,399
MXDS	Spofford Auxiliary Airfield	402	32	5	3,836
MXPX	AF Marina (Amistad Lake)	101	45	9	4,367
CDUA	NEXRAD Brackettville, TX	1	8	2	670
MXDU	ILS	3	6	1	186
TOTAL		**4,862.43**	**613**	**241**	**2,038,458**

Source: 47 CES/CERR, October 2005

3.1.6 Socioeconomic Conditions

Del Rio, Texas, with a 2000 population of 33,867, is an urban hub for surrounding rural areas in Val Verde County. The International Bridge directly connects Del Rio to its sister city, Ciudad Acuña, Mexico.

This close link makes Del Rio a throughway for trade and tourism between the US and Mexico. Although its location is relatively remote, Del Rio is connected to the outside world by US 90 and 277, a Union Pacific Railroad line, and the Del Rio International Airport. The city has a growing manufacturing base, which has benefited in recent years from the implementation of the North American Free Trade Agreement (NAFTA). Another benefit of NAFTA to the area has been a steadily improving exchange of trade between the US and Mexico which flows through Del Rio. As the largest city in the region, Del Rio has developed a successful retail sector, which draws the surrounding rural population. Its proximity to the Mexican border and to Lake Amistad has attracted a growing number of tourists to the city.

Although manufacturing, trade, and tourism are increasing sectors of the regional economy, the majority of the work force (over 4,589 people living in Del Rio) is employed by governmental agencies.

The next largest segment of the work force is engaged by the local school district and regional health care services. Laughlin AFB has a definite and quantifiable effect on the socioeconomic conditions of the surrounding communities. The overall total economic impact for FY08 is $316,888,546 of which the details are provided in Table 3-3.

TABLE 3-3 Economic Impact

Item	Value
Annual Payroll	$132,579,594
Value of Indirect Jobs	$80,986,270
Annual Expenditure	$103,322,682
Total	**$316,888,546**

Source: Laughlin AFB FY08 Economic Impact Statement, 47 CPTS/FMA, September 2008

3.2 VICINITY PROFILE

3.2.1 Regional Profile

Laughlin AFB is located six miles east of Del Rio, Texas. Both are part of Val Verde County and the Rio Grande River Valley Region of Texas. Only nine miles from base, the International Bridge passes over the Rio Grande River to Ciudad Acuña in Coahuila, Mexico. Laughlin AFB sits just off US 90 and is about 150 miles west of San Antonio, the closest metropolitan center. The regional setting is illustrated in Figure 3-3.

Other properties used by the base are listed below.

- Spofford Auxiliary Field – remotely located five miles southwest of Spofford, Texas.
- Recreation Annex – located on Lake Amistad, 24 miles west of Laughlin AFB off US 90, includes South Winds Marina.
- Next Generation Weather Radar (NEXRAD) Site – located 8.8 miles southeast of Brackettville, Texas.

3.2.2 Local Government

A mayor and a six-person city council are elected to govern the City of Del Rio. Day to day business is managed by an appointed city manager. The city government of Del Rio is also responsible for the operation of the International Bridge to Mexico and the Del Rio International Airport.

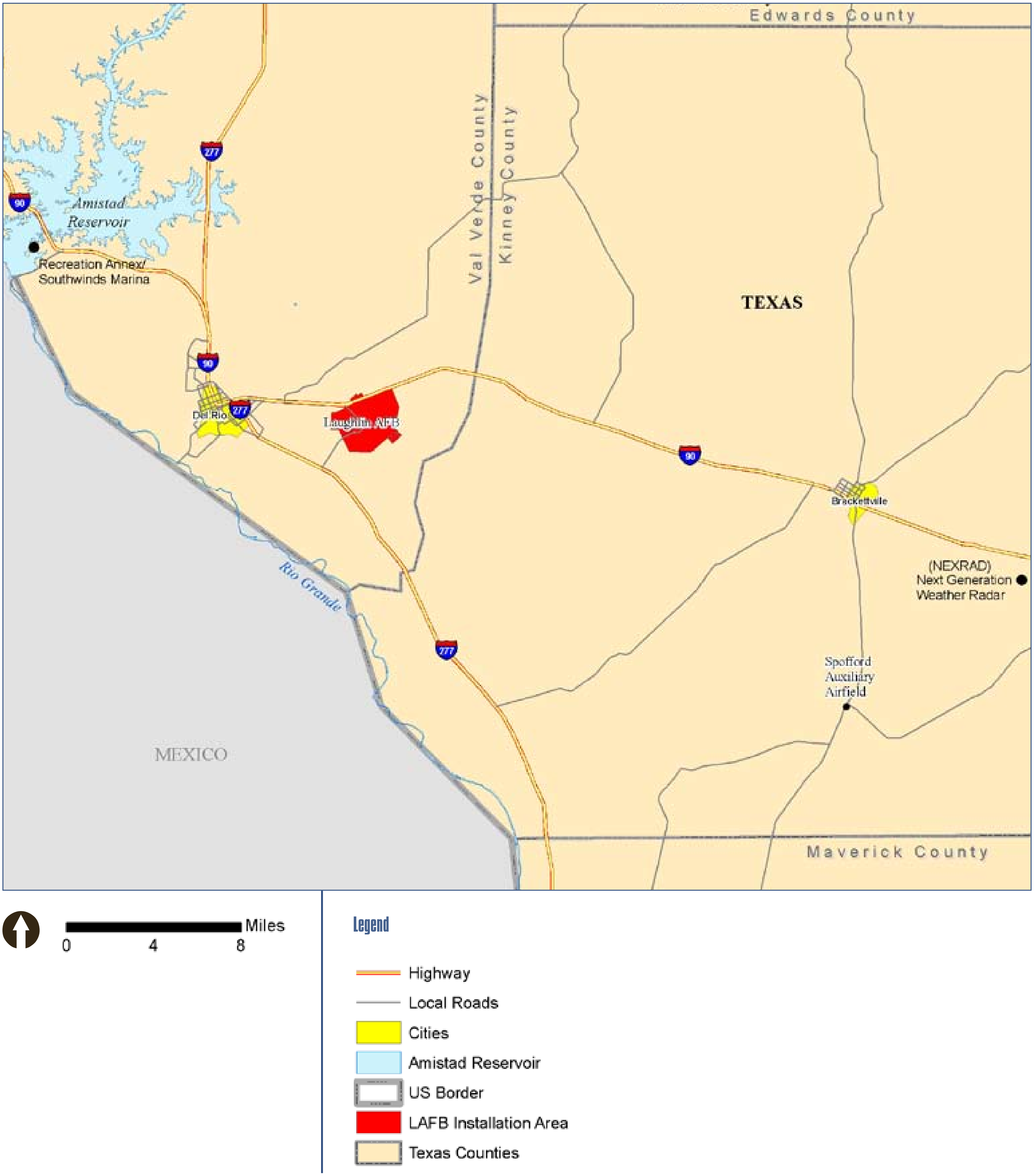
The city has a Planning and Code Department that oversees community planning and zoning issues. Laughlin AFB is not located inside the Del Rio city limits but falls within its five-mile surrounding Extended Territorial Jurisdiction (ETJ). This means that the Del Rio Planning and Code Department has jurisdiction to regulate the unincorporated areas surrounding the base. Val Verde County is a member of the Middle Rio Grande Development Council, a regional planning organization, with the potential to make decisions that may affect Laughlin AFB.

3.2.3 Community Involvement

Laughlin AFB has a long history of working cooperatively with city and county government agencies to their mutual benefit. The base plays an essential role in the local economy as a major employer and consumer of goods and services. Many Air Force military members and civilian employees live in the Del Rio community and contribute to its volunteer organizations, schools, churches, and recreational leagues.

The Del Rio Military Affairs Association (MAA) is part of Del Rio Chamber of Commerce and is run by local Civic leaders. The goal of the association is to promote good relations between the local community and businesses and Laughlin AFB. About every two years, the base opens its gates to display Air Force aircraft and its Airmen to the community by hosting an air show.

FIGURE 3-3 Regional Setting Map



4

4.0 COMPONENT PLANS

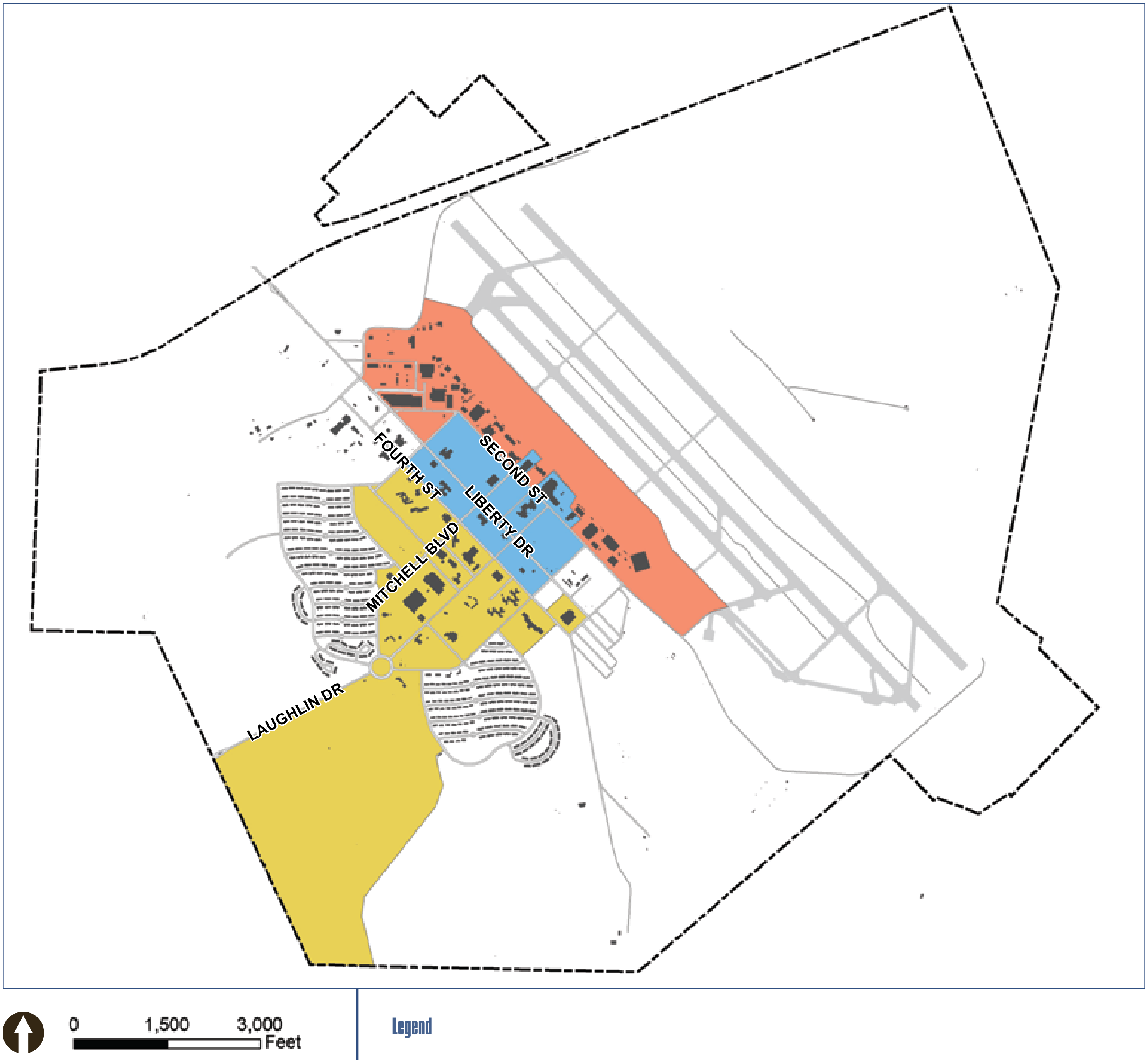
4.1 COMPONENT PLAN OVERVIEW

The Component Plan Overview is the core of the General Plan in that it integrates the contents of the four component plans required by AFI 32-7062, Air Force Comprehensive Planning. This section summarizes the four component plans, the factors associated with Laughlin AFB's current state, and the base's potential to support future development. This chapter consists of the following:

- **Composite Constraints and Opportunities** – Includes the analysis of conditions and factors that could impact the ability to use or develop the base's real property and available land. Topics covered in this section include natural, cultural, environmental, and operational constraints.
- **Infrastructure** – Describes and assesses all infrastructure: security, fire protection, landscape architecture, water supply system, sanitary sewer system, storm water drainage system, natural gas system, liquid fuels, electrical system and backup power, airfield lighting, central heating and cooling, communications, voice, base pavements, airfield pavement, transportation, and roof systems. It addresses each system's ability to support current and future base demand and development.
- **Land Use and Transportation** – Presents current land uses and transportation networks. This section highlights the relationship between land use and transportation supporting Laughlin AFB's mission.
- **Capital Improvements** – Examines existing and future facility and infrastructure needs and provides for the programs and projects proposed to help Laughlin AFB efficiently achieve its stated mission. The CIP also reflects programs and projects recommended in the installation's housing plans and three ADPs. As illustrated in Figure 4-1, the three ADPs are:
  - Flightline ADP
  - Campus Center ADP
  - Community Center ADP

This section contains a description and assessment of existing conditions and provides a set of proposed programs and projects to be implemented as part of this General Plan. These projects cover a range of activities, from studies to facility construction.

FIGURE 4-1 Area Development Plans Map



Legend

- Flightline Study Area
- Campus Center Study Area
- Community Center Study Area
- Installation Boundary

4.2 COMPOSITE CONSTRAINTS AND OPPORTUNITIES

This component summarizes natural and man-made factors potentially affecting future development at Laughlin AFB. Each of these factors falls into one of three categories: natural and cultural resources, environmental quality, and operational and safety constraints . Factors in these categories can greatly influence the potential use of Air Force real property. Air Force Policy Directive (AFPD) 32-70, Environmental Quality, requires the implementation of environmental programs throughout the Air Force. The goals of these programs include cleanup, compliance with environmental regulations, natural and cultural resources conservation and management, and pollution prevention.

4.2.1 Natural And Cultural Resources

It is the policy of the Department of Defense (DoD) to protect and conserve natural and cultural resources for which it is responsible. In addition Laughlin AFB provides planned and coordinated management for development, improvement, maintenance, and conservation of the base's natural and cultural resources, in keeping with the accomplishment of assigned missions. This ensures that conservation of resources and execution of military mission are not mutually exclusive.

To protect resources, the intent of these policies must be a consideration in all current and planned development activities, including master planning, construction, site approval requests, and training exercise plans.

This section summarizes the natural and cultural resources at Laughlin AFB and provides the basis for evaluating potential effects of the General Plan on the environment. While the presence of these resources might present a moderate constraint on future development, they contribute to the aesthetic, cultural, social, and recreational features of the installation, and therefore to the overall quality of life on base. Refer to the Laughlin AFB Integrated Natural Resource Management Plan (INRMP) (USACE 2007) and the Laughlin AFB Integrated Cultural Resource Management Plan (ICRMP) for further discussion of specific opportunities and constraints.

Semi-arid Climate Ideal for Flying

Climate

The Del Rio area has a semi-arid, continental climate with dry winters and hot summers. The average temperature in the winter is 55 degrees Fahrenheit (F). The average temperature in the summer is 95 degrees F; however, temperatures often exceed 100 degrees F, with a record high of 112 degrees F. Winter cold spells seldom last more than a few days, and snow may fall once a year.

Prevailing winds are southeasterly from April through October, and from November through March northwesterly winds bring more abrupt day-to-day changes in temperature. The average annual rainfall is 18.2 inches with more than 80 percent of the annual precipitation occurring from April through October. During this period, rainfall is predominantly in the form of heavy downpours and thunderstorms.

In an average year, there are only 19 days when the ceiling is less than 3,000 feet and/or visibility is under three miles, making weather conditions optimal for flight training.

Southwest Texas Topography, Source: www.npsot.org/symposium2007/home/regions.shtml

Geology And Physiographic

Laughlin AFB lies within the Great Plains Physiographic Province at the junction of the Edwards Plateau and the Rio Grande Plain regions. The Edwards Plateau, which runs north of US 90, is characterized by high, dry limestone ridges, scrub brush, and poor surface soil. The Rio Grande Plain lies to the south of US 90 and is characterized by gently rolling plains and somewhat richer and deeper soil.

The underlying geology is limestone of the Georgetown formation, which is a basal member of the Washita Group, Cretaceous in age. Depth to bedrock generally varies from zero to 20 feet. The base lies near the edge of the Balcones Fault Zone, but there are no active faults or seismic activity in the immediate area. Oil, gas, and manganese deposits are found in the area, but are generally not of sufficient quality and quantity to be of commercial interest.

Topography

The general terrain of Laughlin is a moderately rolling expanse of low hills and flats, sloping slightly to the southwest. The highest point on the base, 1,121 feet above mean sea level (MSL), is a knoll located at Sixth Street and Mitchell Boulevard. The lowest point is 1,024 feet above MSL along Sacatosa Creek located near the eastern base perimeter. The official elevation of the airfield is 1,082 feet MSL.

Soils

Soils generally consist of sandy clay or caliche, a composite of clay, sand, and limestone gravel. Within these deposits are localized zones which are very hard due to secondary cementation. This can cause difficulty when excavating. In certain areas of the base, the caliche overburden is underlaid by lean clay of low to medium plasticity, commonly known as Del Rio Clay.

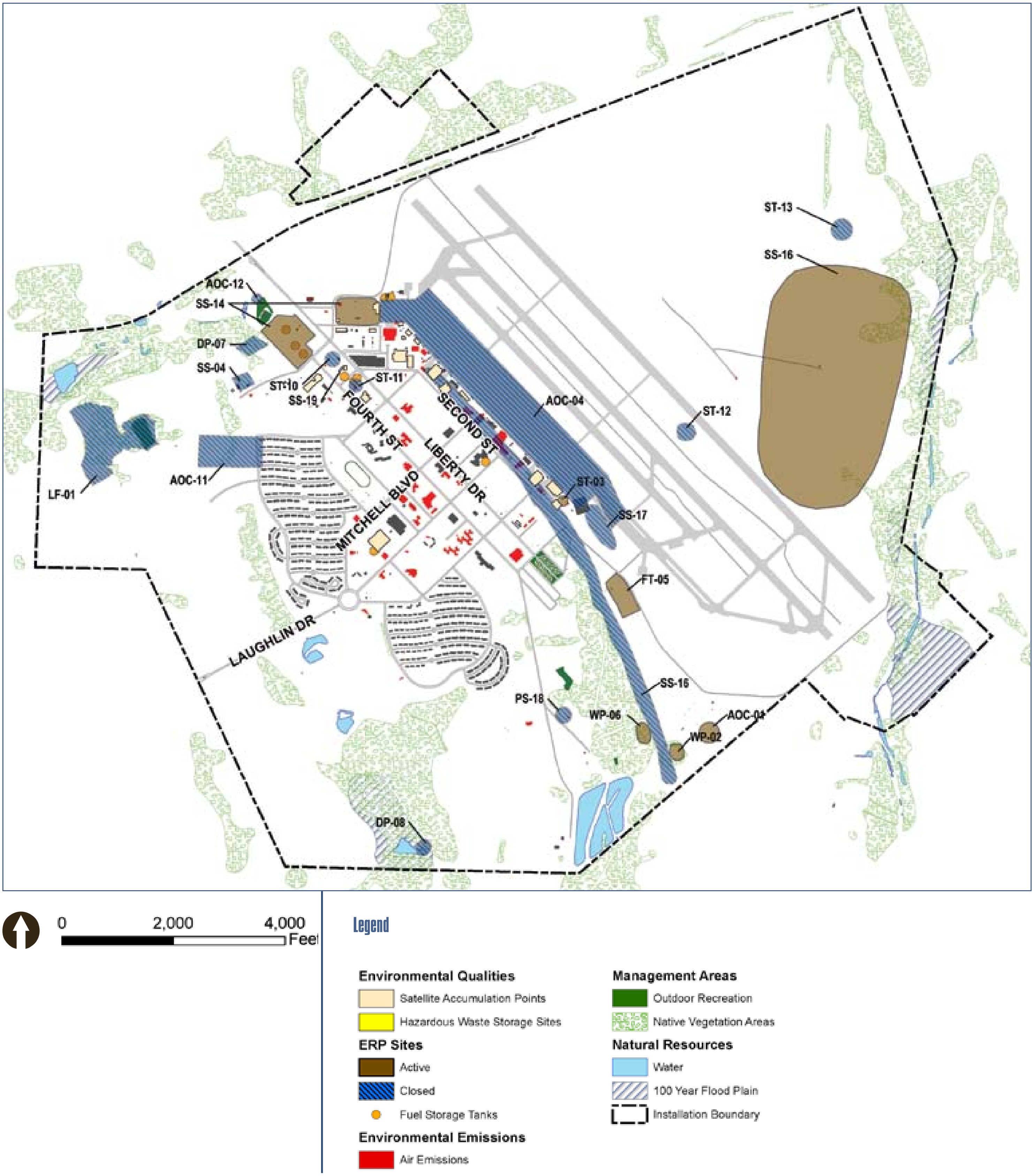
The caliche supports a sparse growth of vegetation. The primary erosion problem is the maintenance of backfill around new structures as the occasional intense rain tends to wash backfill soil away. This can be controlled by proper gradient and planting.

Hydrology

The watershed of the area consists of small creeks which flow into the Rio Grande River or Amistad Reservoir. Laughlin AFB has a limited number of bodies of water. These include the base sewage lagoons, golf course ponds, and small bodies of water along the northwestern and southern base boundaries (Figure 4-2). The northeast portion of the base drains to Sacatosa Creek. The cantonment area is drained by a ditch that runs along Second Street south past the sewage lagoons, and into an unnamed streambed which flows into Sacatosa Creek, and then into the Rio Grande. The southwest part of the base, including the golf course and Privatized Housing, drains into an unnamed creek, which flows into the Rio Grande. Zorro Creek, to the west, drains a portion of the northwest end of the base, and then flows into the Rio Grande.

The Edwards-Trinity Aquifer supplies water to this region, feeding San Felipe Springs, one of the largest springs in Texas. The City of Del Rio obtains its water from this spring, which, in turn, supplies a portion of the water to Laughlin AFB. The domestic water supply supplements any deficiency in water quantity. The springs have an average discharge of 90 million gallons per day. The water supply of the aquifer is extremely abundant.

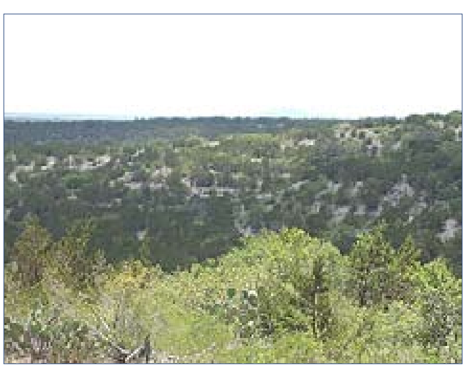
FIGURE 4-2 Environmental Resources Map



Storm Water Channel along Second Street

Storm Water Culverts

Semi-improved Area on Base



Southwest Texas Vegetation, Source: hillcountryhuntingranches.com/leona_ranch

Floodplain

The floodplain of Sacatosa Creek runs along the eastern boundary of the base and through the southern clear zone of the runways. The nature trail in the northwest corner of the base is within a small portion of the Zorro Creek floodplain. A holding pond in the southwest portion of the base periodically fills with water from an unnamed creek that drains the golf course. Floodplains are shown in Figure 4-2.

Flooding has occurred in the area running along the south end of the aircraft parking ramp to the southeast end of the runway. This is not attributed to stream overflow, but rather to the ground's slow absorption rate in this region. During heavy rains, the volume of rain that falls is greater than the ground's ability to absorb. Compounding the ground's slow absorption rate is the large amount of sheet runoff associated with extensive paved areas across the base, specifically near the airfield. The construction of airfield apron drains and a large drainage channel along Second Street helped to alleviate some of the potential for flooding.

The Laughlin AFB Airfield Storm Water Drainage Infrastructure Plan (Conceptual Design Report) was completed in July 2005 to help understand and correct storm water drainage problems along the aircraft parking apron and airfield. To alleviate severe flooding along the flightine and aircraft parking aprons, the study recommended enlarging a number of the drainage pipes under the aircraft parking apron and First Area, while also relocating the airfield drainage connection with Second Street to a location south of Building 507.

The airfield drainage issues will be resolved in three phases:

- The drainage ditch along Second Street will be repaired. To further improve storm drainage system performance along the Flightline, the base is also in the process of enclosing the Second Street open storm water channel. This drainage project started in November 2009, and is scheduled to be complete in February 2011.
- The drainage system in First Area will be upgraded.
- A drainage system will be installed on the airfield.

Wetlands

Wetlands have not been formally delineated at Laughlin AFB. However, potential wetland areas have been identified during previous studies. Potential wetlands are generally located along the base perimeter on underdeveloped lands in the northwestern and eastern portions of the base. The largest potential wetland is found within the Nature Trail area along Zorro Creek. A smaller potential wetland is located near the center of the base's eastern boundary and is attributed to Sacatosa Creek, an intermittent creek-dry creek bed.

Vegetation

In pre-settlement times, the base may have been mid-grass grassland with dominant bluestem, except for the floodplain and wetland sites. Today, the unimproved areas are predominantly West Texas grasses and xeric species of thorny and woody scrub brush. Common grasses include buffalo grass (*Buchloe*), witchgrass (*Panicum capillare*), and johnson grass (*Halepensis*). Larger plants include purple sage (*Salvia leucophylla*), crucifixion thorn (*Castela emoryi*), and Texas palo verde (*Cercidium texanum*). Trees include stunted mesquite (*Prosopis glandulosa*) and acacia. Vegetation along the Sacatosa and Zorro Creeks includes larger mesquite trees, thicker stands of grasses, and varieties such as reeds, yaupon (*Ilex vomitoria*), and sunflower (*Helianthus annus*).

The semi-improved areas, which are mowed, are planted with johnson grass, bermuda (*Cynodon dactylon*), lehman love (*Eragrostis lehmanniana*), and king ranch bluestem (*Bothriochloa ischaemum*) grasses. The improved areas on the base are mowed, tended, and irrigated. These areas are planted in bermuda and St. Augustine (*Stenotaphrum secundatum*) grasses.

A 1997 Urban Forestry Survey found 77 species of trees within the cantonment area. Seventy percent of the tree population consists of seven species: Arizona ash (*Fraxinus velutina*), live oak (*Quercus virginiana*), red oak (*Quercus rubra*), mesquite, crape myrtle (*Lagerstroemia indica*), cedar elm (*Ulmus crassifolia*), and mondell pine (*Pinus brutia*). Laughlin AFB has been a member of Tree City USA since 1992. The base has a vigorous tree program and currently has over 5,000 trees, half of which are less than six inches in diameter. Figure 4-2 illustrates the tree canopy on base.

The current landscaping policy favors "xeriscaping" which minimizes water use while maximizing aesthetics and maintainability. Drought and disease tolerant native plants are used as much as possible due to limited rainfall in the area.

Wildlife

Whitetail deer are often seen on base, even in populated areas. A 10-foot deer fence along the northeast side of the airfield helps keep deer off the airfield, reducing the potential for aircraft/animal incidents. Numerous smaller mammals inhabit the base including coyotes, skunks, armadillos, jackrabbits, ground squirrels, raccoons, possums, and javelinas. Although turkey vultures, black vultures, and hawks are sighted, none are known to roost within the base. Other birds include grackles, crows, ravens, larks, robins, martins, swallows, and mourning and white-winged doves. Rattlesnakes are common in the unimproved areas, along with turtles, bull snakes, and king snakes.

Threatened And Endangered Species

The United States Fish and Wildlife Service has determined that there are no federally listed, threatened, or endangered species on Laughlin AFB. The Texas Parks and Wildlife Department has determined, based on a search of the Texas Natural Heritage Program Information system, that two known special species have been spotted at least once at the base. They are the Texas indigo snake (*Drymarchon corais*) and Texas horned lizard (*Phrynosoma cornutum*). There are no known threatened plants on base.

Val Verde County has four federally threatened or endangered birds, one fish, one clam, and two flowering plant species. A biological survey of Laughlin AFB (TPWD 1995) did not find any of these species, however, two rare plant species, longstalk heimia (*Heimia longipes*) and Texas trumpet (*Acleisanthes crassifolia*) were found on the installation. Longstalk heimia is known to occur in five locations on Laughlin AFB, in the floodplain areas along Sacatosa Creek on the eastern edge of the base and in the floodplain of the unnamed southwest drainage along the southern perimeter road west of the sewage ponds (USAF 2005c). A small population of Texas trumpets was found in a shrubland on a gravelly slope in the northwest quarter of the installation near the western perimeter fence (USAF 2005c).

Historic Preservations And Archeological Resources

No buildings or structures on base are listed on the National Register of Historical Places (NRHP). An inventory and assessment of the Cold War-era (1945–1991) built environment at Laughlin AFB was conducted by Geo-Marine, Inc., in October 2000. The assets evaluated as

Softball Field

Tennis Court

Golf Course Club House

FAMCamp

possible Cold War resources were determined to either lack exceptional Cold War significance or had been architecturally altered to a degree that they were recommended not eligible for listing on the NRHP under Criterion Consideration G.

Archaeological resources are abundant in this region from activity dating back 12,000 years. Thirteen archaeological sites were identified at the installation in a survey completed in 1996 by the Center for Archaeological Research at the University of Texas. The sites include prehistoric open campsites, buried trash dumps, and turn-of-the-century homestead ruins. Only four of these sites were determined eligible for inclusion in the NRHP.

Outdoor Recreation Areas

Laughlin AFB has many outdoor recreational resources as shown in Figure 4-3. Ball fields and tennis courts provide facilities for interactive sports. Other recreational areas include a swimming pool and numerous playgrounds and picnic areas. The base also has a horse stable and a trap and skeet range.

The Leaning Pine Golf course offers a nine-hole course, a driving range, and a putting green. The club house (Building 494) contains a pro shop, lounge, and snack machines.

A fitness course complements the 2.4-mile bicycling and jogging trail traversing portions of the Privatized Housing areas and the Community Center area. The nature trail through the Zorro Creek area features observation blinds and educational signs. About 1,300 acres of land are managed to protect the habitat of all species and to provide for the hunting of featured species. The FAMCamp area consists of 20 spaces for overnight recreational vehicle (RV) parking available to retirees and military identification card holders. Located behind the Base Exchange (BX), the FAMCamp offers concrete parking pads with electric, water, sewer, and cable television hookups.

The base also maintains outdoor recreation facilities at Lake Amistad. The Lake Amistad Southwinds Marina is located 24 miles west of the base on US 90 within the Lake Amistad National Recreation Area. This off-base recreational area provides many water-oriented sports such as boating, fishing, swimming, water skiing, and jet skiing. Fishing, pontoon, house, and ski boats are available for rent. In addition, there is a marina store, picnic shelters, playgrounds, and a camping area with 20 RV pads.

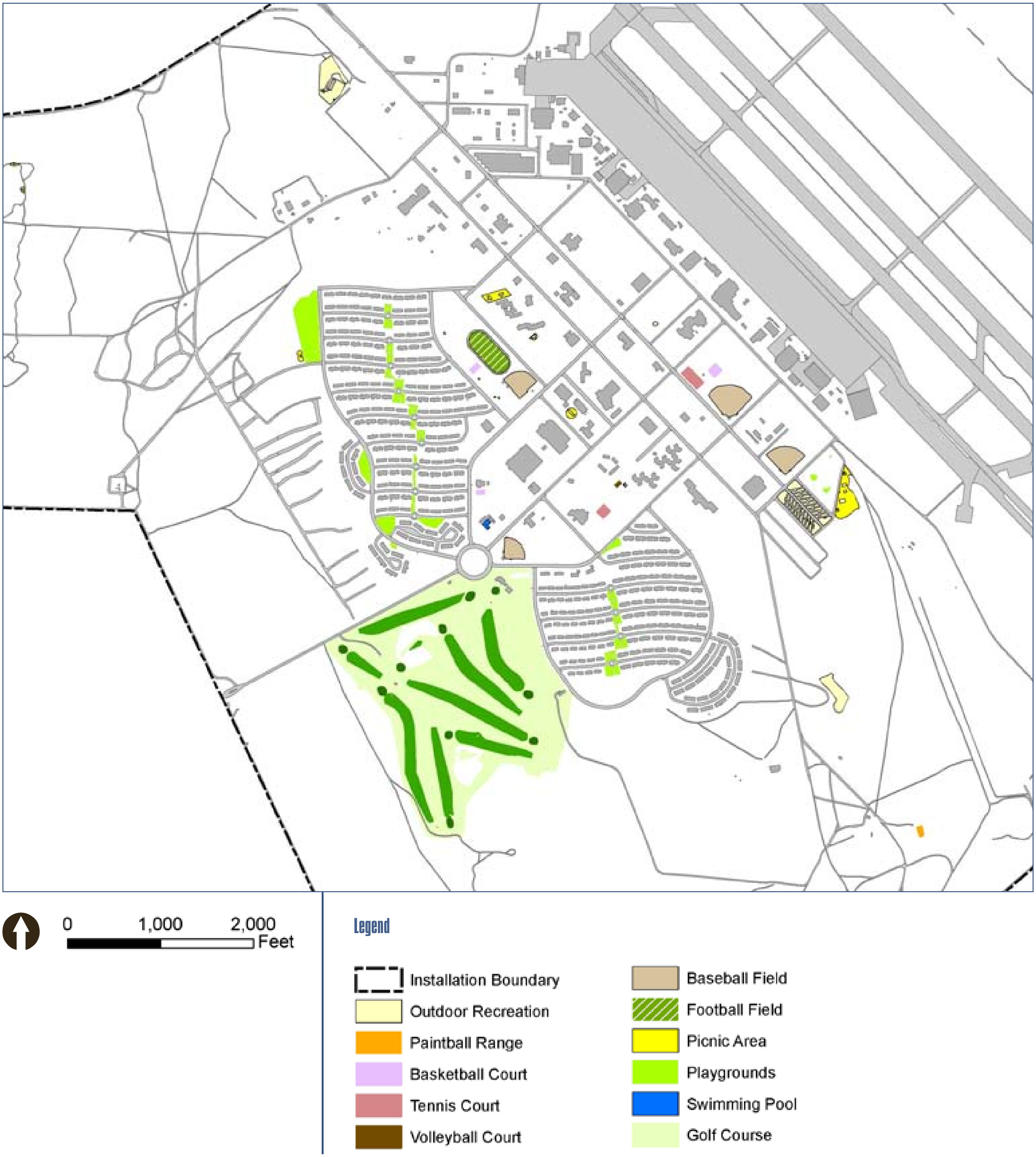
Pest Management

Laughlin AFB has no significant pest problems other than the occasional control of ants, mice, cockroaches, bats, pigeons, snakes, bees, and scorpions. Special training and equipment has been provided for Africanized honeybee control. Preventative measures against the West Nile Virus include biannual shots for the base horse population and treatment of standing water ponds to minimize mosquito breeding.

The successful pest management program at Laughlin AFB is a result of regular inspections and integrated pest management techniques. The program, which is conducted by base personnel and private contractors for most areas on base, includes inspection and control of a wide variety of pests on an as-needed basis. Privatized Housing residents are responsible for the control of pests in their homes and are permitted to contract with civilian pest control services if they choose.

The pest management shop, Entomology, is located in the CES maintenance area (Building 129) and is managed by the Base Operating Support (BOS) contractor.

FIGURE 4-3 Outdoor Recreation Map



Sewage Lagoons Attract Wildlife

Sewage Lagoons Contribute to BASH

Bird/wildlife Aircraft Strike Hazard (BASH) Plan

Laughlin AFB and the Spofford Auxiliary Airfield are located on the western edge of the Central Migratory Bird Flyway, resulting in the increased potential for in-flight encounters with birds. As a result, the base has an aggressive BASH plan to minimize bird strike hazards caused by nesting, migrating, or feeding birds. The plan provides procedures for a timely response to observed bird activity in the area and the management of the vegetation and potential food sources around the airfield that might cause an increase in bird activity. The sewage lagoons are considered a major attractant to the bird population and, therefore, contribute to the BASH statistics.

The Laughlin AFB BASH program utilizes numerous methods to deter bird/wildlife hazards, including an innovative pesticide/herbicide program that seeks to minimize food sources for wildlife. This program has been selected as a test program for AETC and Laughlin AFB is actively participating to determine pesticide/herbicide efficacy in mitigating the BASH hazard. In addition, Laughlin AFB is testing organic pesticides to determine their effectiveness in deterring wildlife food sources, while minimizing the risk to the environment.

Land Management Plan

Laughlin AFB implemented a Land Management Plan to promote the effective management of natural resources occurring on base. The intent of this plan is to conserve the installation's natural resources by providing an aesthetically pleasing and comfortable environment for base personnel, while allowing for the adjustment, modification, and manipulation of those resources to support mission operations.

As shown in Figure 4-4, Laughlin AFB has improved, semi-improved, and unimproved areas. Approximately 29 percent of the lands at Laughlin AFB are improved areas. The improved areas, such as administration, operation and maintenance, community use, and Privatized Housing require maintenance of lawns and landscaping. Semi-improved grounds, such as the airfield areas and clear zones, comprise an estimated 41 percent of the base and require only periodic maintenance. Approximately 30 percent of the base remains as unimproved grounds and requires only minimal maintenance.

4.2.2 Environmental Quality

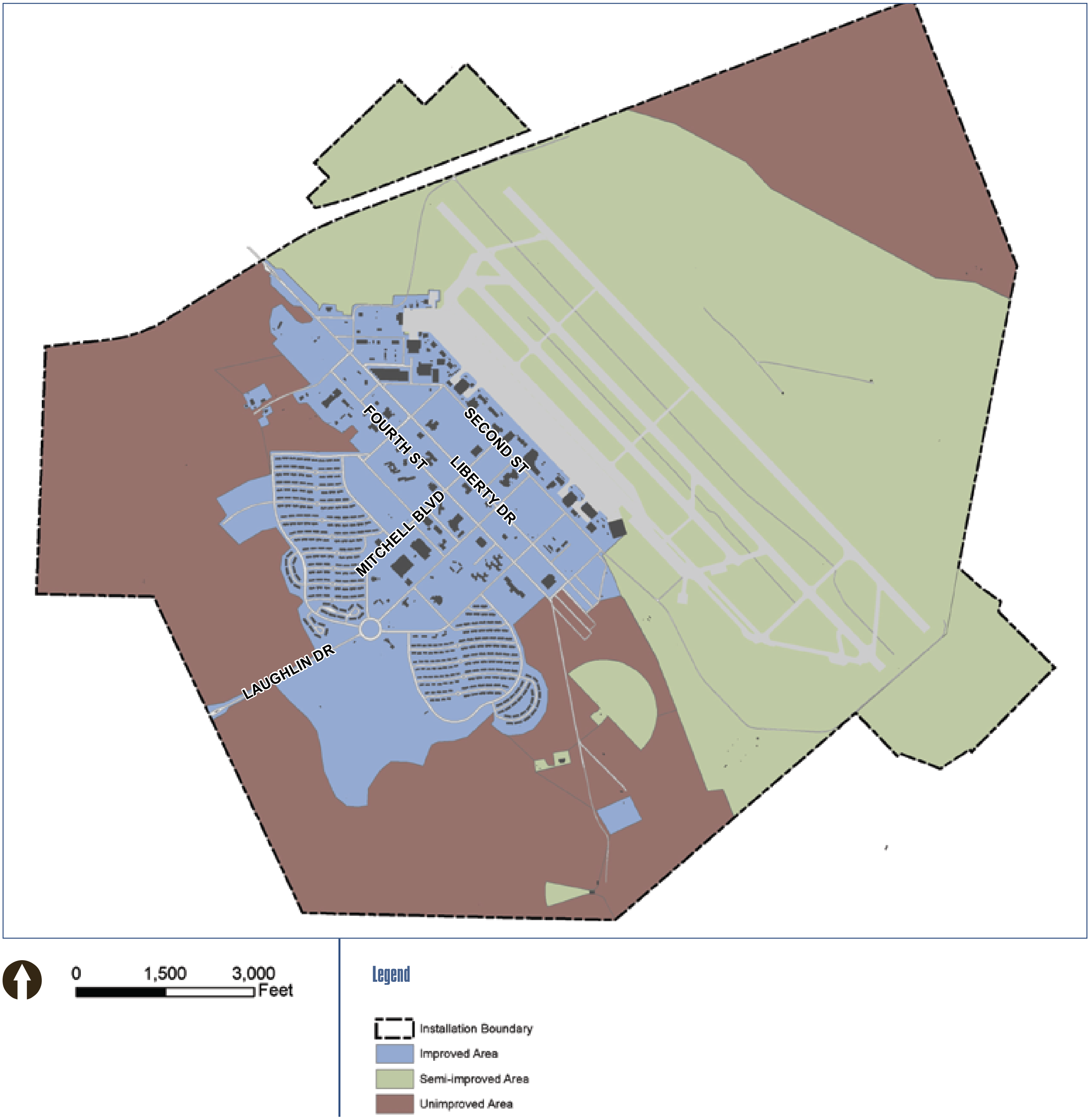
In addition to the natural and cultural resources described in the previous section, man-made environmental quality issues also play an important role in shaping base land use decisions. A comprehensive set of policies and plans have been established to ensure that Laughlin AFB's assigned missions do not adversely affect the surrounding natural environment. The current status of the individual components of the environmental compliance program are summarized in the following paragraphs.

Hazardous Waste/Materials

Laughlin AFB implemented a Hazardous Waste Management Plan to provide guidance, information, and direction for the proper management of base generated hazardous waste in accordance with all applicable local, state, federal, and Air Force regulations. Hazardous waste generated on base includes lead-based paint, contaminated materials, cleaning solvents, hazardous mixed liquids, and medical waste.

Hazardous wastes are initially collected at satellite accumulation points in a container designated as the receptacle for a particular waste stream. The total volume for any waste stream in one location cannot exceed 55 gallons of hazardous waste or one quart of acutely hazardous waste.

FIGURE 4-4 Land Management Map



Disposal Units for Recyclable Materials

Wastes are accumulated at satellite points until the maximum limits are exceeded or the waste stream becomes inactive. Once either condition is met and within three days, Laughlin AFB transports the container from the satellite accumulation points to the 90-day storage area (Building 20300) if registered as a large quantity generator (>1,000 kg/month) or the permitted facility (Building 2026) if registered as a small quantity generator (<1,000 kg/month). The locations of accumulation facilities are shown in Figure 4-5.

Located in Building 75, Laughlin AFB's hazardous materials pharmacy promotes pollution prevention by monitoring all hazardous materials generated and stored on base.

Disposal Units for Solid Waste

Solid Waste Disposal And Recycling

All non-hazardous solid waste generated on base is collected by contractors and then disposed at the Del Rio Landfill. Although Laughlin AFB owned and operated an on-base landfill from 1942 until 1975, no on-base landfill is currently in operation. The former on-base landfill site is now ERP site LF001.

The Laughlin Recycling Center is located in Building 2018 and is managed by a private contractor. The Recycling Center collects from 25 sites throughout the base but no longer includes the Privatized Housing. Grounds maintenance waste and Privatized Housing yard waste are composted to the maximum extent possible.

During the first three quarters of 2005, Laughlin AFB diverted an average of 39% of its solid waste through recycling and composting. During the last two quarters of FY 10, Laughlin AFB averaged 40% diverted from the total solid waste going to Del Rio's landfill through recycling, reuse, and composting efforts.

Fuel Farm

Fuel Storage

The base maintains numerous active and inactive fuel storage tanks. Of the fuel storage tanks located on base, 18 must be regulated due to their size and type. As listed in Table 4-1 and illustrated in Figure 4-5, the base currently has 16 active regulated aboveground storage tanks (AST), one oil-water separator (OWS), and one underground storage tank (UST). The UST belongs to a contractor, GTE. The diesel ASTs were abandoned in place after the removal of the emergency power generator at the medical clinic.

Laughlin AFB has been aggressively removing substandard USTs and single-walled ASTs that require diking with double-walled ASTs.

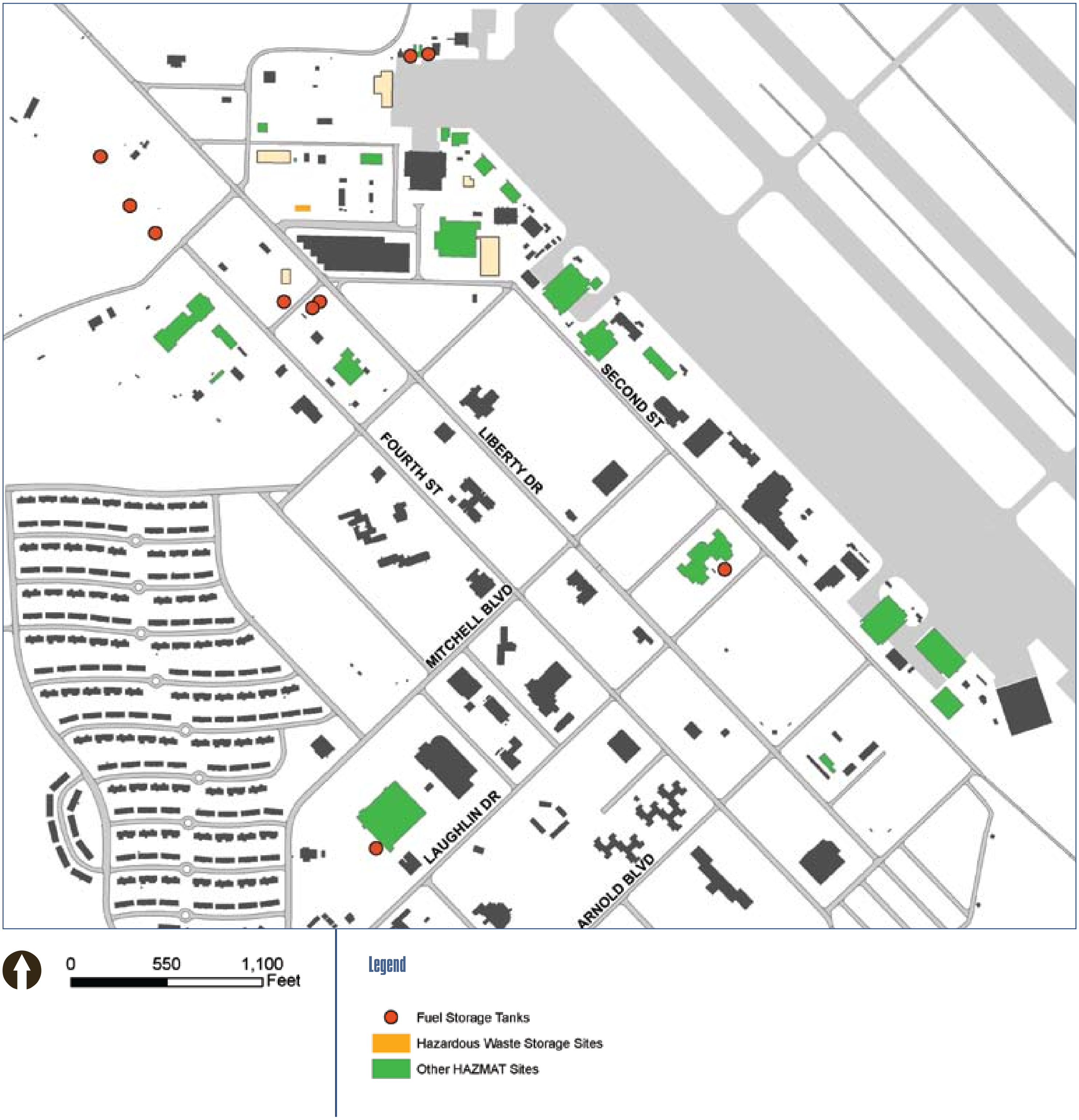
Jet Fuel Storage Tank

TABLE 4-1 Fuel Storage Tanks

Tank Type	Fuel	Number
AST	JP-8	5
AST	Diesel	5
AST	Motor Gasoline (MOGAS)	6
OWS	Oil/Water	4
UST	Diesel	1

Source: 47 CES/CEV, April 2010

FIGURE 4-5 Hazardous Waste and Fuel Storage Map



Environmental Restoration Program (ERP)

In an effort to protect the environment and human health, the USAF developed the ERP, formerly the Installation Restoration Program (IRP), to identify, investigate, mitigate, and ultimately close out sites with histories of contamination due to hazardous waste spills or disposal.

Since the implementation of the program at Laughlin AFB in 1985, a total of 20 ERP sites and four areas of concern (AOC) have been identified (Table 4-2). Twelve of the ERP sites and one of the AOCs were determined to need No Further Action/No Further Response Action Planned (NFA/NFRAP); all are considered closed. The remaining sites and AOCs are undergoing investigation with no site currently under remediation. Three ERP sites are currently undergoing long-term monitoring (LTM): DP007, FT005, and SS016. Six ERP sites are currently under remedial investigation: PS018, SS004, SS014, SS015, SS019, and SS020. One of the ERP sites, SS017 (the area south of the Flightline), is undergoing a feasibility study concurrently with a remedial investigation.

The contaminated soils were to be remediated in the 2008 to 2009 timeframe by removing the contaminated soils and disposing of them in a regulated disposal facility. Remediation activities and associated monitoring are anticipated to commence during the fiscal year of 2008. Additional sampling and determination as to the extent of the groundwater contamination was planned to occur in the 2007-2008 timeframe; based upon those findings, remediation activities will commence in 2010.

No plumes are caused by base pollutants located outside of base boundaries. Furthermore, no affects to adjacent off-base land uses are associated with these ERP sites or AOCs. As the base makes progress in its ERP mitigation efforts, the sites will be closed. In order to close a site, NFRAP documentation must be provided to the Texas Commission on Environmental Quality (TCEQ), formerly the Texas Natural Resource Conservation Commission (TNRCC). Table 4-3 lists Laughlin's sites with a NFRAP Inventory Control Management (ICM) Category. Criteria for a NFRAP decision includes:

- Those made after the preliminary assessment, where no contamination was found.
- The site inspection, where the contaminant concentrations did not exceed Applicable or Relevant and Appropriate Requirements.
- The Remedial Investigation/Feasibility Study, where the levels of contamination did not pose risk to human health or the environment.
- The Remedial Action Plan, where removal, treatment, containment, or other appropriate method was determined to be satisfactory.
- Long-term monitoring, where monitoring has confirmed that there is no longer a threat to human health or the environment from contamination left in place.

Several community involvement initiatives under the ERP provide the public an opportunity to participate in ongoing environmental restoration activities and decisions. The Restoration Advisory Board (RAB) is a formal organization that meets periodically to provide a forum for the community and regulatory interaction in Laughlin AFB's ERP process. The community has the opportunity to review ERP decision-making reports and correspondence through the off-base Information Repository and the on-base Administrative Record. A community relations plan identifies community concerns and recommends strategies to promote public participation in the ERP. Other community involvement activities include the preparation of ERP fact sheets and a video presentation. The RAB provides an open forum and serves in an advisory capacity to Laughlin AFB and other government agencies.

TABLE 4-2 ERP Sites

Identified Site No.	Description	Remedy In Place	Site Closeout/ Site Complete Date
LF-01	Base Landfill	7/15/1987	4/15/2000
WP-02	Old Industrial Waste Pond	9/30/2006	9/30/2007
ST-03	Defuel Pit	9/30/2006	OPEN
SS-04	DRMO	6/30/2010	CLOSED (date unknown)
FT-05	Old and Current Firefighter Training Area	12/31/2008	12/31/2011
WP-06	New Industrial Waste Pond	9/30/2006	9/30/2007
DP-07	Sludge Disposal Area	9/30/2006	9/30/2007
DP-08	South Boundary Dike	8/13/2000	8/13/2000
SS-09	Supply Storage Area	9/30/2006	9/30/2007
ST-10	Facility 121, UST	11/30/1999	11/30/1999
ST-11	Facility 126, UST	11/30/1999	11/30/1999
ST-12	Facility 640, UST	11/30/1999	11/30/1999
ST-13	Facility 660, UST	11/30/1999	11/30/1999
SS-14	Fuel Off-Loading Header Area	12/31/2008	12/31/2011
SS-15	Industrial Waste/Storm Water Trench	12/31/2008	12/21/2008
SS-16	MARS Building and Area	6/30/2011	6/30/2016
SS-17	Area South of Flightline	6/30/2011	CLOSED (date unknown)
PS-18	Building 800 Pesticide Facility	3/25/2014	CLOSED (date unknown)
SS-19	Building 116 Heating, Ventilation and Air Conditioning (HVAC) Shop	3/25/2014	CLOSED (date unknown)
SS-20	Jet Engine Test Cells	3/25/2014	CLOSED (date unknown)
Areas of Concern			
AOC-04	Flightline Apron	11/3/2004	11/03/2004

TABLE 4-3 ERP NFRAP Sites

Category	Location
LF-01	Base Landfill
DP-08	South Boundary Dike
ST-10	Facility 121,UST
ST-11	Facility 126, UST
ST-12	Facility 640, UST
ST-13	Facility 660, UST
AOC-04	Flight Apron

Air Emission

The air quality at Laughlin AFB is considered good according to state and federal standards. Laughlin AFB does not have the volume of pollutants that would classify it as a Title V facility; as verified by an annual air emissions survey. Title V refers to federal air pollution standards associated with the Clean Air Act Amendments of 1990. Laughlin AFB is considered a Synthetic Minor and has self-imposed air emissions maximums with the State of Texas, which relieves it from requiring a federal permit.

Since it does not have the volume of pollutants to classify it as a Title V facility, the base operates under a series of operating permits and standard exemptions. Operating permits are legally enforceable documents that permitting authorities issue to air pollution sources after the source has begun to operate. Facilities that have air emissions are shown in Figure 4-2.

Storm Water and Wastewater Discharge

Due to the industrial activities associated with flying operations, storm water runoff generated at this installation has a high potential for contamination. Activities involving aircraft maintenance and refueling could contaminate storm water flows if not prevented or contained before entering the runoff streams. Many measures are in place to control possible contamination, including numerous oil/water separators and containment dikes. In the event of an incident, the base has a detailed spill response program. Storm water sampling is regularly conducted in accordance with the requirements mandated by the Texas Pollution Discharge Elimination System (TPDES) Multi-sector General Permit. Figure 4-6 shows the storm sewer and wastewater lines at Laughlin AFB.

Laughlin AFB is divided into four storm water drainage areas, as shown in Figure 4-7. Drainage Area 1 covers most of the cantonment area and a portion of the airfield. The storm drainage system in this area was recently improved by the construction of a ditch traversing south along Second Street to the sewage treatment plant. Area 1 has one outfall located in the middle of the southern base boundary, which accommodates both the drainage area and the treatment plant. Area 1 discharge flows a distance of approximately four miles across farmland to Sacatosa Creek. Drainage Area 2 drains the northwestern portion of the base and has one discharge point that flows directly into Zorro Creek. Drainage Area 3 drains the southwestern portion of the base, including Privatized Housing and the golf course. The outfall for this area is located on the southern boundary with discharge flowing about eight miles to the Rio Grande River. The eastern portion of the base, including the remaining portions of the airfield, is in Drainage Area 4. This area has no outfall points and storm water flows across the eastern and northeastern boundary onto adjacent farmland and along the railway line to the north.

Limited treatment plant outfall is due to the moisture evaporation from the hot Texas climate. Wastewater effluent is governed by an operating permit which requires analytical quality testing and meeting requirements of the TCEQ.

Drinking Water Supply

The Del Rio Water Treatment Plant provides chlorinated water to Laughlin AFB. Bacteriological water sampling occurs monthly, and samples are collected every three years and sent to the state for lead and copper testing. Laughlin AFB publishes its annual Water Quality Report, also called the Consumer Confidence Report every July. The base reports on the quality of its drinking water supply using data from the most recent EPA-required tests. As a result of these tests, Laughlin's drinking water quality is considered good.

FIGURE 4-6 Storm Sewer and Wastewater Map

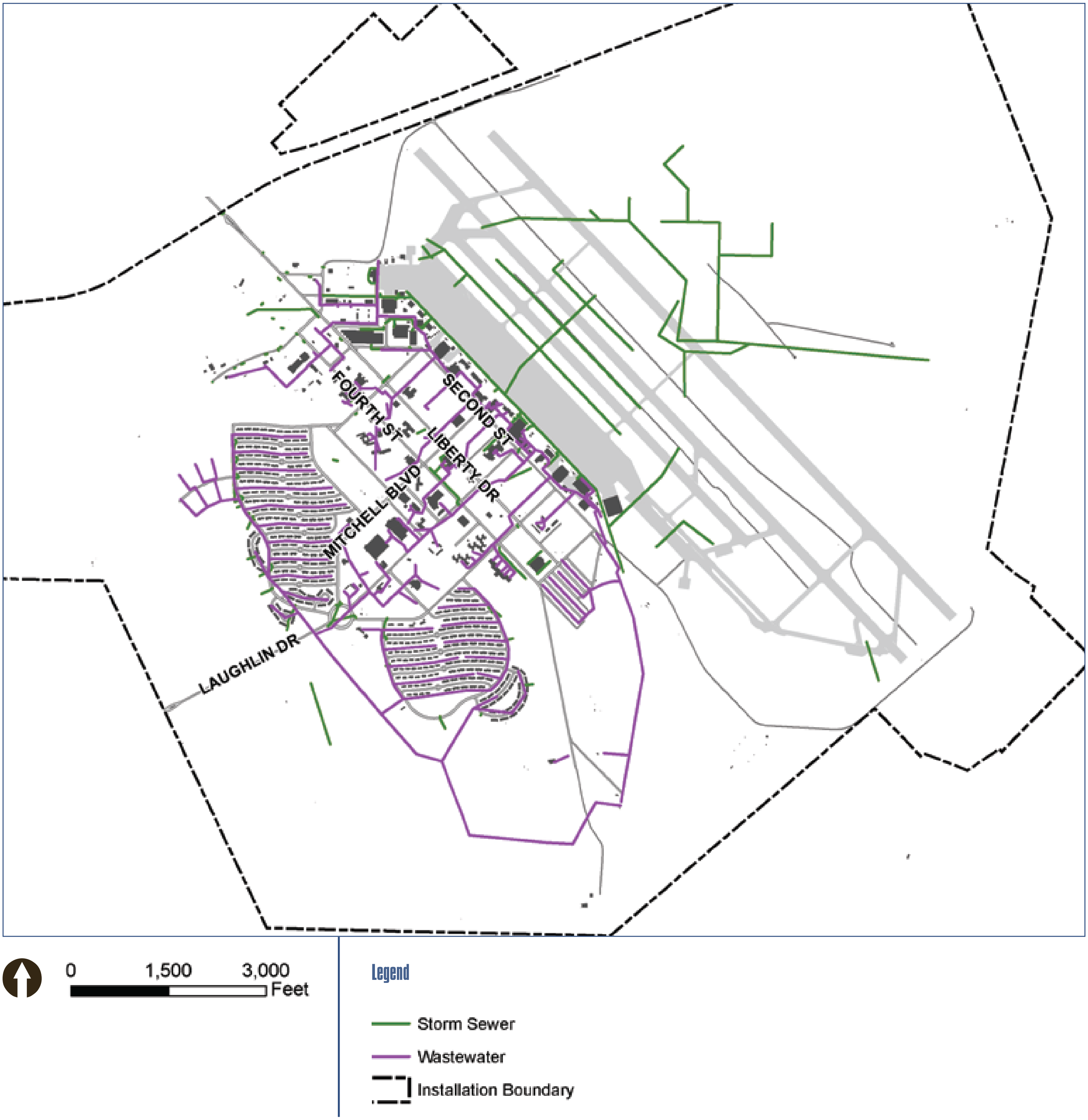
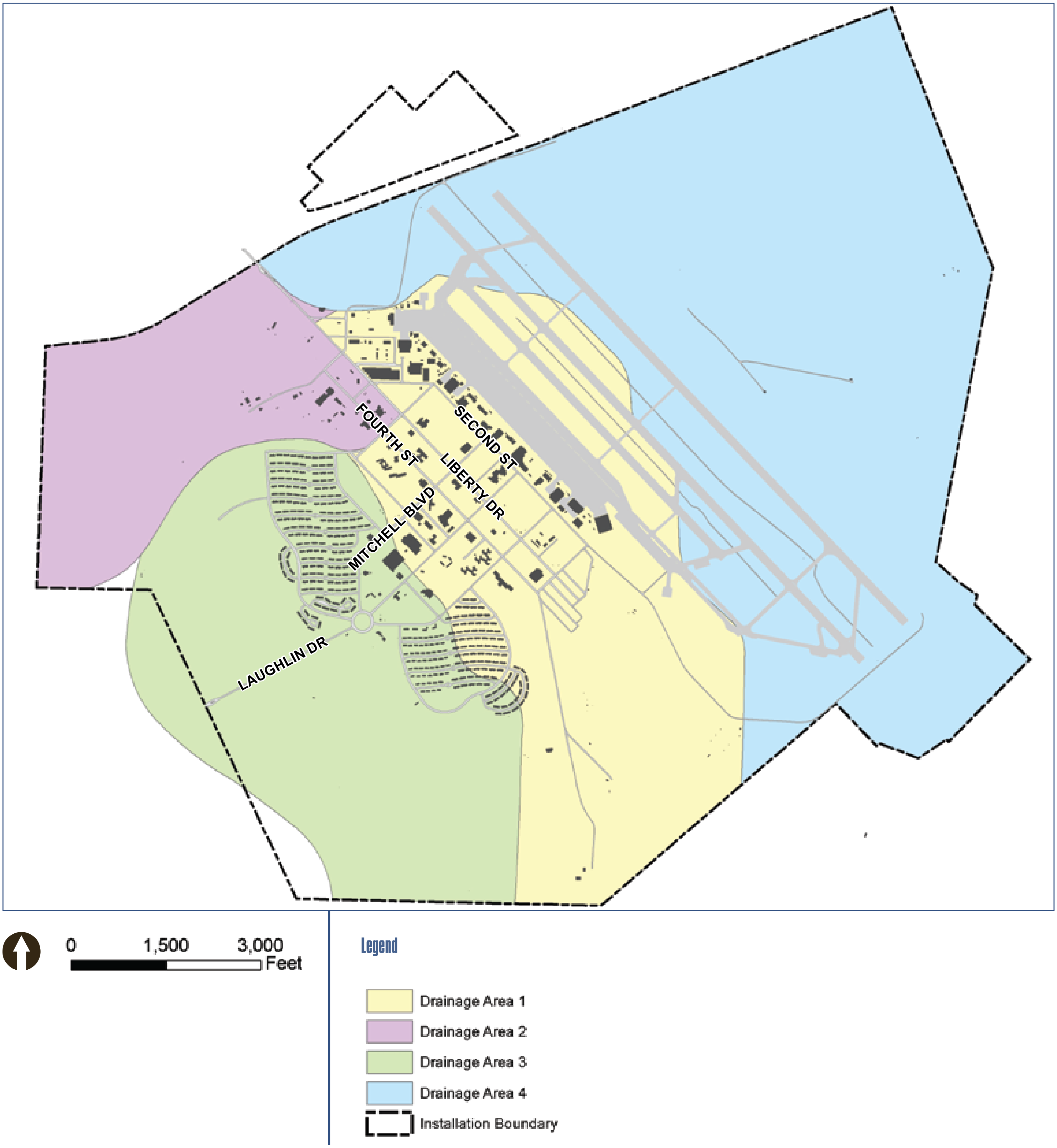


FIGURE 4-7 Drainage Areas Map



Radon Emissions

The installation has been tested for radon, and none was found. The underlying geology of Laughlin AFB is not typical of areas with radon emissions.

Asbestos and Lead-based Paint

Sources of asbestos and lead-based paint are found in older facilities located on base. On Laughlin AFB, asbestos is typically found in the following locations:

- Sprayed or troweled onto surface materials such as ceilings
- Insulation on pipes, boilers, and ducts
- Miscellaneous wall board, ceiling tiles, and floor tiles
- Transit water pipes

Laughlin AFB's Asbestos Management Plan and Asbestos Operations and Maintenance Plan establishes procedures for the identification of asbestos materials, removal of asbestos fibers, and maintenance of the asbestos program.

Common sources of residential lead exposure on base are typically found in:

- Chalking or peeling lead-based paint
- Some inexpensive, vinyl mini-blinds
- Plumbing
- Contaminated soils
- Some household goods (earthenware, ceramic tile, pewter, etc.)

Construction workers engaged in activities involving cutting, welding, or grinding painted steel; abrasive blasting; or sanding associated with repainting structures previously coated with lead-based paint (LBP) are potentially at risk to exposure to very high concentrations of lead. In addition, high levels of lead in the soil have been found around structural steel and shooting ranges.

According to AETC, priority is given to correcting LBP issues using the following prioritized list:

- Child daycare centers, annexes, playground equipment
- Air Force licensed family daycare in Privatized Housing
- Pediatric wards/clinics and waiting areas
- Temporary Lodging Facilities (TLFs)
- Youth centers and recreational facilities
- Playgrounds
- Air Force maintained DoD schools
- Privatized Housing currently occupied with children <7 years of age
- Privatized Housing occupied with a pregnant woman
- Privatized Housing constructed before 1978
- Remaining Privatized Housing (All Laughlin AFB Privatized Housing window frames are aluminum; therefore, no lead is present in window sills.)

The Laughlin AFB LBP Management Plan (December 2004) established installation procedures for LBP identification, removal, and risk reduction. Interior components containing LBP in Privatized Housing units on base were removed as part of renovations conducted from 1993 to 2004. LBP components remaining in renovated houses consist of all exterior wood (including façade, trim, and roof overhangs). Non-appropriated Privatized Housing has not been renovated and may contain LBP on interior and exterior painted surfaces. These houses include Buildings 8150-8159, 8200-8213, and 9200-9225.

Through renovations and new construction, Laughlin AFB is eliminating the hazards of asbestos and LBP The results are maintained in a database detailing facilities containing asbestos and LBP. As projects come on-line, the database is used to identify problems, which are then managed and abated.

4.2.3 Operational And Built Constraints

It is critical that existing and future development on Laughlin AFB be compatible with airfield operations and other mission-related activities. Factors influencing development decisions include airfield clear zones and other imaginary surfaces required to safeguard against aircraft accidents, aircraft noise, and explosive safety constraints.

Airfield Clearances

Airfield operations impose constraints on land uses and facility height for areas on or around the airfield. UFC 3-260-01, Airfield and Heliport Planning and Design establishes clearance criteria for fixed and rotary winged aircraft. Identifying hazards and restricting development in areas impacted by airfield operations provides safety for aircraft and minimizes the number of people exposed to danger. Appendix C contains a portion of Laughlin AFB's Air Installation Compatible Use Zone (AICUZ), 2008, that lists land use compatibility with danger zones.

Laughlin AFB's three parallel runways are oriented northwest, southeast, and traffic patterns are flown to the southwest and northeast of the runways. Radar controlled patterns are flown to the northeast of the base. The three types of constraints that affect, or result from, flight operations are:

- Height restrictions identified by Federal Aviation Regulations (FAR) Part 77. Public agencies involved with the approval of construction permits should require developers to submit calculations proving their projects meet the regulatory criteria.
- The second constraint involves noise zones produced by computer simulation of average flight activity. The base's simulated Day-Night Noise Levels (DNL) are measured in decibels (dB) and appear as contours on the Air Installation Compatible Use Zone (AICUZ) Map (Figure 4-8).
- The third constraint involves Accident Potential Zones (APZs) based on statistical analysis of past DoD aircraft accidents. The clear zones, the areas closest to the runway ends, are the most hazardous areas. Generally, the DoD acquires clear zone land through purchase or easement to prevent development. APZs extend beyond the clear zone from the runway end. In the APZs, land use planning and controls are strongly encouraged for the welfare and safety of the public.

AOCs on Laughlin AFB are the Primary Surface, Transitional Surface, and Clear Zones, also known as runway imaginary surfaces (Figures 4-9, 4-10, and 4-11). All obstacles within the imaginary surfaces must be identified and evaluated to ensure safety. Obstacles that violate the imaginary surface can either be man-made or environmental. There are three categories of obstacles:

- Waivers – are an acknowledgement of an airfield obstruction that does not conform to airfield criteria. A waiver's primary purpose is to promote awareness of the obstacle to aircraft operations.
- Deviations – are changes from established standards that are warranted and justified based on the given circumstances, but are within acceptable safety limits.
- Exemptions – apply to items that are needed for airfield operations, such as runway approach lights. Exemptions typically apply to facilities built before the current criteria were established.

The Air Force decreased the Building Restriction Line (BRL), which is the distance measured parallel from the centerline of the runway at which facilities may be constructed. With the movement of the BRL, numerous waivers became unnecessary. Laughlin AFB was able to reduce its airfield obstructions from approximately 300 in 2000 to 18 permanent waivers and 4 temporary waivers for the base and 4 permanent waivers for Spofford Auxiliary Field in September 2010. Although Laughlin AFB has made significant progress in reducing its number of airfield obstructions, the base must continue to work to eliminate existing obstructions. Table 4-5 details the permanent waivers for both locations.

Noise

The AICUZ program focuses on people and their comfort, safety, and protection. The AICUZ study prepared for Laughlin AFB recommends land use restrictions and encourages the adoption of land use controls based upon those recommendations.

Table 4-4 lists land uses considered compatible for the various DNL noise contours. Figure 4-8 illustrates the current noise contours for the installation based on the June 2008 Laughlin AFB AICUZ Study. This study indicates that most of the off-base land within the noise contours, clear zones, and APZs are in agricultural use. Small portions of both residential and commercial land inside Del Rio are within the 65 DNL contour. Del Rio has adopted zoning for the land around the base as it falls within their three-mile ETJ. An ETJ relates to the City's ability to regulate subdivision plats and issue related permits.

TABLE 4-4 Off-base Land Use Compatibility Chart (Aircraft Noise)

Generalized Land Use	DNL Noise Contours (dB)			
	65-69	70-74	75-79	80+
Residential	Yes	No	No	No
Commercial	Yes	No	No	No
Industrial	No	No	No	No
Public/Quasi-Public	No	No	No	No
Recreational	No	No	No	No
Open/Agriculture/Low Density	Yes	Yes	Yes	Yes

Source: Laughlin AFB Air Installation Compatible Use Zone (AICUZ) Study, June 2008

FIGURE 4-8 Noise Map

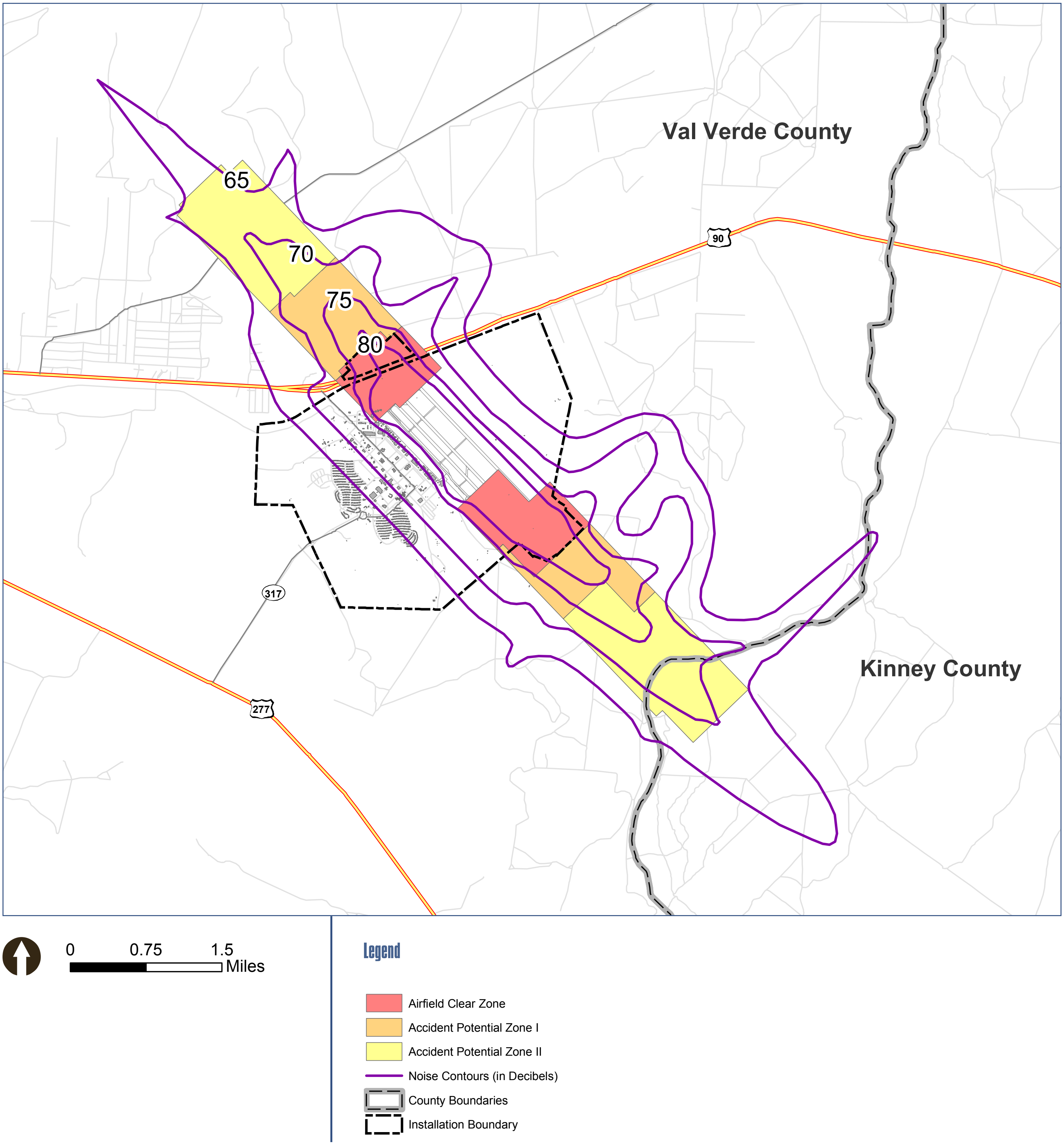
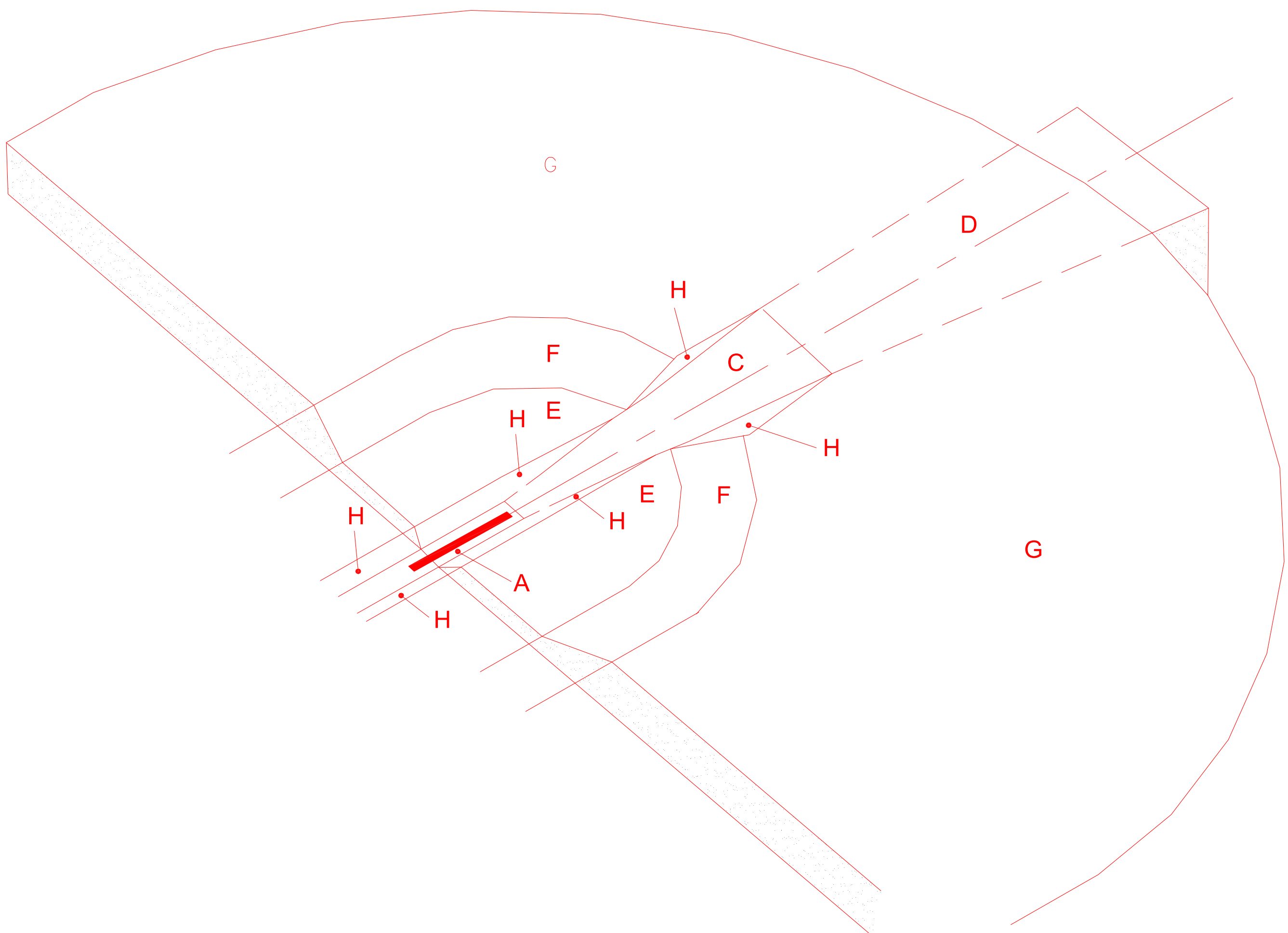


FIGURE 4-9 Air Force Imaginary Surfaces Isometric

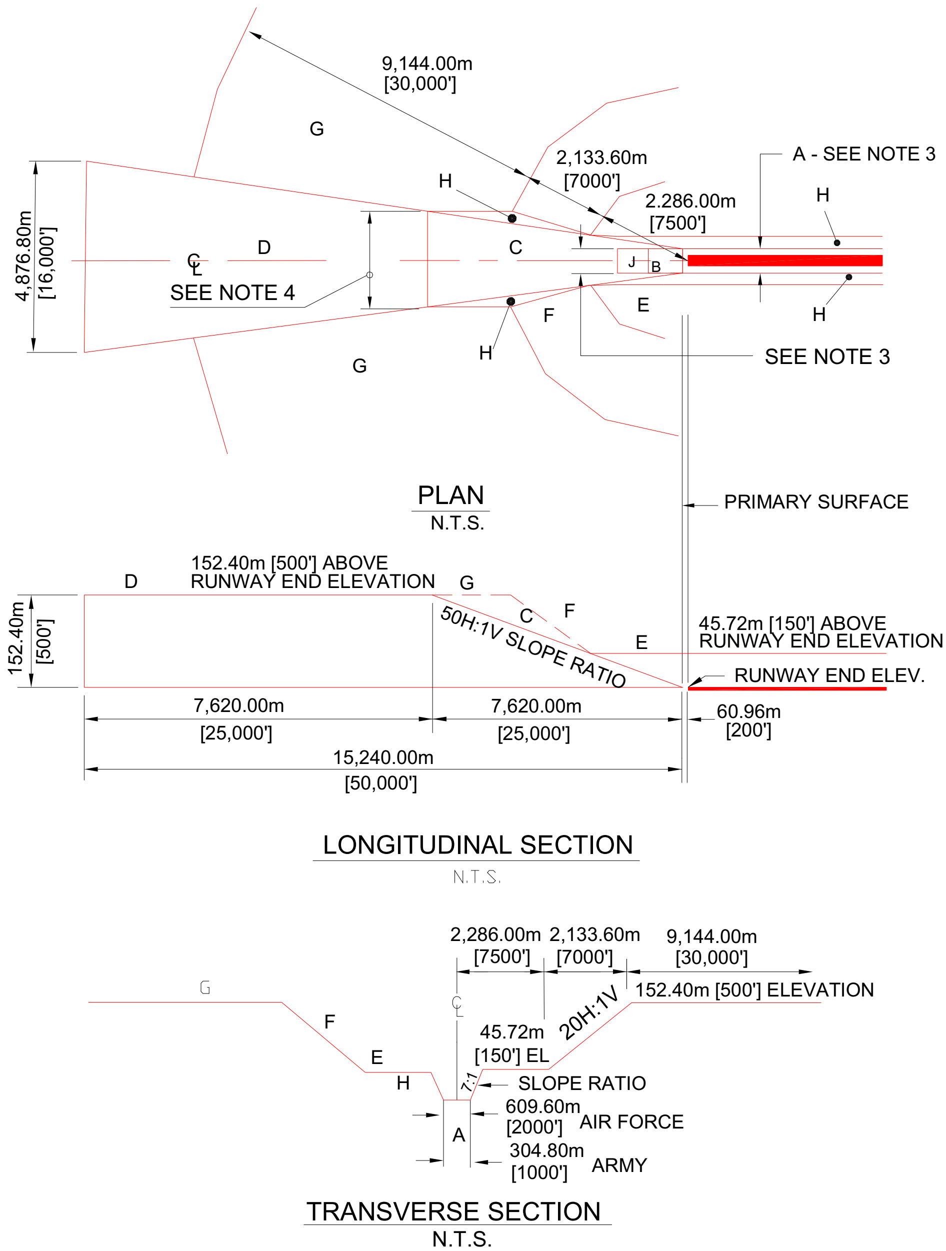


ISOMETRIC

LEGEND

A PRIMARY SURFACE
B CLEAR ZONE SURFACE (NOT SHOWN)
C APPROACH-DEPARTURE CLEARANCE SURFACE
(50:1 SLOPE RATIO)
D APPROACH-DEPARTURE CLEARANCE SURFACE (HORIZONTAL)
E INNER HORIZONTAL SURFACE (45.72m [150'] ELEVATION)
F CONICAL SURFACE (20:1 SLOPE RATIO)
G OUTER HORIZONTAL SURFACE (152.40m [500'] ELEVATION)
H TRANSITIONAL SURFACE (7:1 SLOPE RATIO)
I NOT USED
J ACCIDENT POTENTIAL ZONE (APZ) (NOT SHOWN)

FIGURE 4-10 Air Force Imaginary Surfaces Plan and Profile



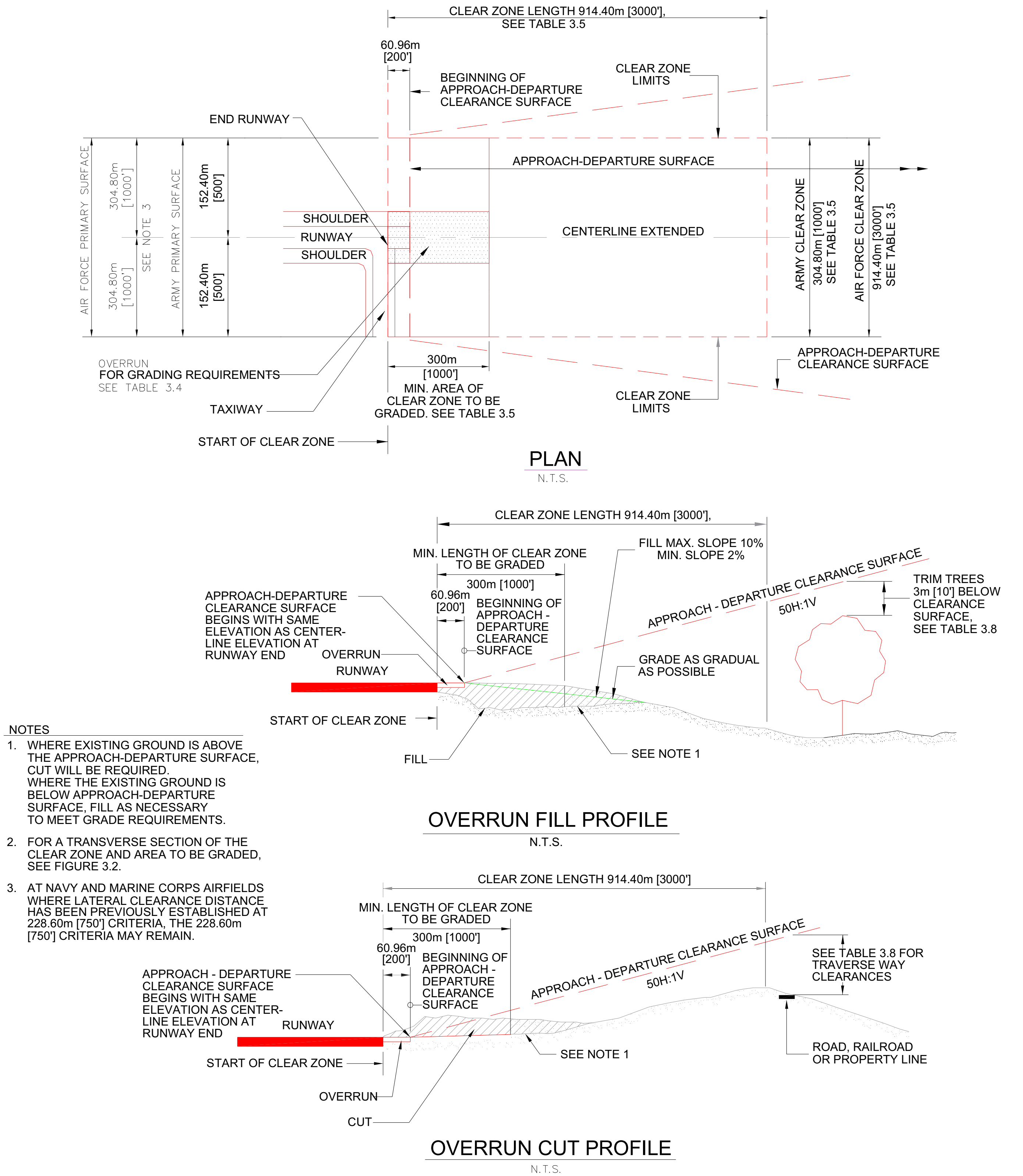
LEGEND

A PRIMARY SURFACE
B CLEAR ZONE SURFACE
C APPROACH-DEPARTURE CLEARANCE SURFACE (SLOPE)
D APPROACH-DEPARTURE CLEARANCE SURFACE (HORIZONTAL)
E INNER HORIZONTAL SURFACE
F CONICAL SURFACE
G OUTER HORIZONTAL SURFACE
H TRANSITIONAL SURFACE
I NOT USED
J ACCIDENT POTENTIAL ZONE (APZ)

NOTES

1. DATUM ELEVATION FOR:
   a. SURFACES D, E, F AND G ARE THE ESTABLISHED AIRFIELD ELEVATION.
   b. SURFACE C IS THE RUNWAY CENTERLINE ELEVATION AT THE THRESHOLD.
   c. SURFACE H VARIES AT EACH POINT ALONG THE RUNWAY CENTERLINE. SEE TABLE 3.7.
2. THE SURFACES SHOWN ON THE PLAN ARE FOR THE CASE OF A LEVEL RUNWAY.
3. 304.8m [1,000'] FOR ARMY AND 609.6m [2,000'] FOR AIR FORCE.
4. 2,590.8m [8,500'] FOR ARMY AND 2,743.2m [9,000'] FOR AIR FORCE.

FIGURE 4-11 Air Force Runway End and Clear Zone Details



Explosive Safety Zone

Buildings 950, 951, 952, 953, 954, and 955 are used to store small arms and aircraft egress items. Building 905 is used for the inspection and maintenance of munitions and egress items. These buildings have a quantity-distance (Q-D) safety zone of 700 feet, measured radially, from the outside walls of the buildings. The hot cargo pad is used approximately twice a month and has a Q-D zone of 2,000 feet.

A primary and alternate explosive cargo route is used to bring vehicles carrying explosives to the munitions storage area, hot cargo pad, and safe storage area. Two routes are required in the event one becomes impassable. Q-D and range safety zones and routes are shown in Figure 4-12. Safety zones are established around the trap and skeet range and the security forces firing range based on the types of weapons used and each range's firing lanes and munitions arcs. There is an acceptance of Public Traffic Route (PTR) Q-D Violation to the on-base road for Building 905 on file. No mishaps/accidents have been documented and the risk involved and exposure time for unrelated personnel is minimal.

Electromagnetic Radiation Source

Laughlin AFB has one major source of electromagnetic radiation, the Digital Airport Surveillance Radar (DASR), which began operations in January 2003. This radar stands on top of a 45-foot platform located within a fenced area west of the 8000-series Privatized Housing area. With 18kW of power, it has an electromagnetic radiation arc extending outward 13.5 feet from the center of the radar. The DASR provides air traffic data to the Radar Approach Control (RAPCON) personnel in Building 308.

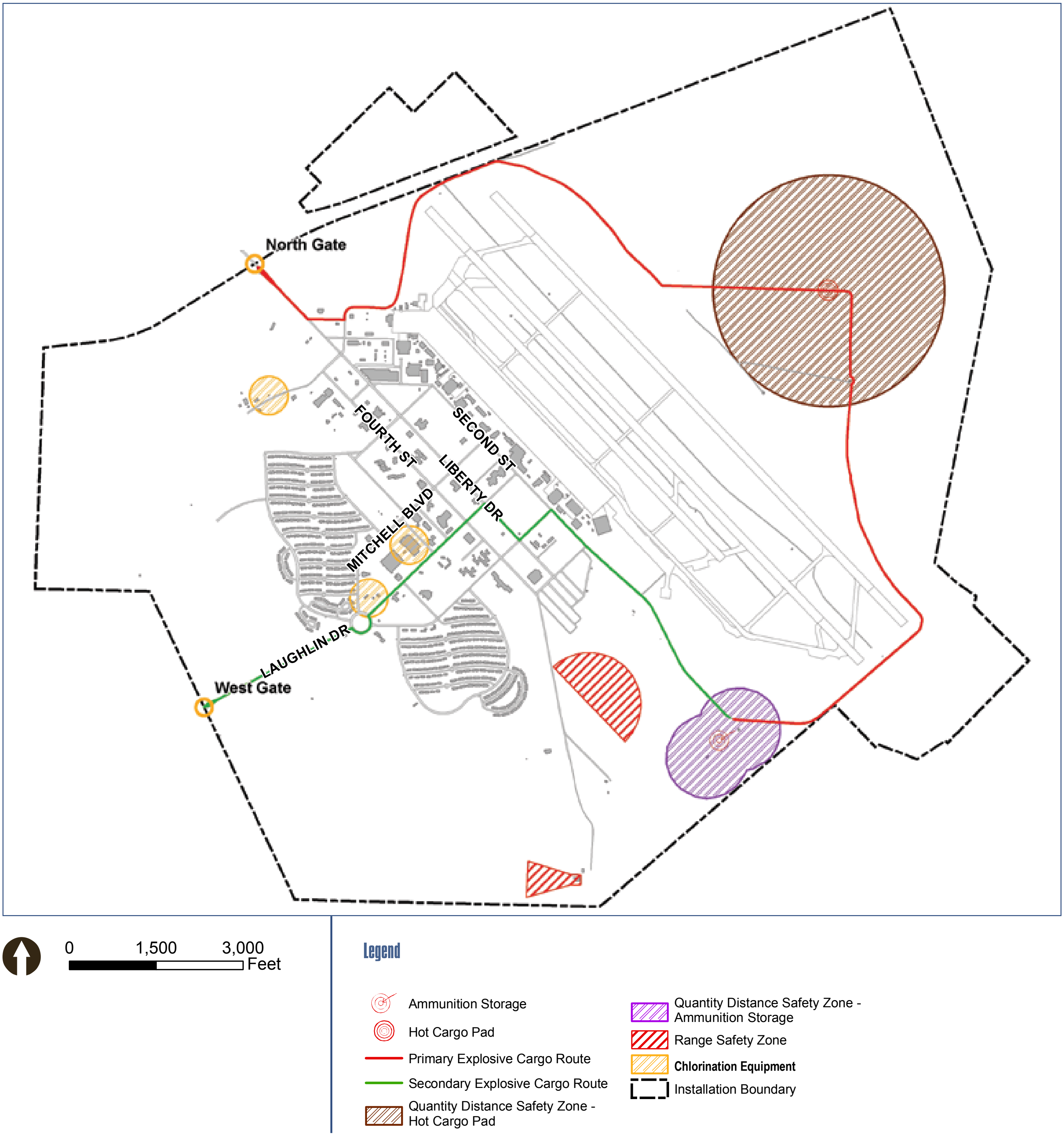
Other radiation sources exist on base; however, they emit low enough levels of electromagnetic radiation not to be considered significant or a danger to personnel. Some of the radiation sources falling into this category are associated with aircraft and airfield operations. These include, but are not limited to, the following:

- Very High Frequency Omni-Directional Radio Range Tactical Air Navigation Aid (VORTAC), located between the runways, with a 2.6-foot electromagnetic radiation hazard arc.
- Radio Transmitting Set (Glide Slope Station) (AN/GRN-31), located near the runways, with a 0.9-foot electromagnetic radiation hazard arc.
- Radio transmitter (AN/GRT-21 and -22, AN/GRC-171 and -171B), located in Building 820 northwest of the sewage treatment plant. This has a 2-foot electromagnetic radiation hazard arc.

Security Zones

The security zones at Laughlin AFB are comprised of the Flightline and fuel storage facilities on base, including the munitions storage area, the aircraft hangars, and the egress shop. The Flightline security zone restricts access to Flightline area; the fuel storage area is fenced to limit access.

FIGURE 4-12 Q-D and Range Safety Zones Map



4.2.4 Security

Five security assessments were conducted on Laughlin AFB between 2000 and 2005. Several security issues have been identified:

- Intrusion Detection – Although the number of intrusions by illegal aliens is down, problems and potential security threats from intruders still remain.
- Entry Control – The current North Gate and search area configuration make it difficult to conduct vehicle search operations.
- Controlled Area Access – Numerous unmanned and unmonitored access points to three controlled areas create security concerns.
- Standoff Distance – A strong barrier plan improved standoff distance around the base, but areas for improvement still remain. Additional barriers are needed to fill in gaps left after the bollard installation. The recently installed automatic bollard system at West Gate can be easily bypassed through empty fields and sidewalks at various points around base.
- AT/FP – Several buildings throughout the installation do not meet current AT/FP standards. The buildings along the flight line have significant opportunities for AT/FP improvements and should be addressed due to the security of the mission and activities taking place in this area.

4.3 INFRASTRUCTURE

The infrastructure component of the General Plan provides an assessment of the infrastructure systems required to support the operation of Laughlin AFB. This section summarizes the current status of each system, evaluates its ability to support current and future requirements, and addresses existing infrastructure, recommended improvements, and the potential for expansion. The utility portion of this infrastructure section will address the following systems: water, sanitary sewer, storm drainage, natural gas, liquid fuels, electrical distribution, heating and cooling, communications, roadway and airfield pavements, and fire protection.

Automatic Bollard System

Activities associated with infrastructure modifications, repairs, new construction, and work around existing infrastructure require a civil engineering work order or construction siting process. In accordance with AFI-32-1021, construction projects are prohibited from being sited on ERP sites. However, if an ERP site is the only practical location for a proposed construction project, the installation must request a waiver to construct. A waiver is required for all proposed construction on an ERP site. The information presented was obtained from personal interviews with the base civil engineer and base operations personnel, plus secondary sources such as utility system condition and capacity studies.

4.3.1 Water Supply System

Overview

Laughlin AFB purchases its water from the city of Del Rio. Del Rio's water supply comes from the San Felipe Natural Springs, which produces 90 million gallons of water per day. This amount is more than adequate to serve the region. Laughlin AFB has a 20-year contract with the city to provide five million gallons of water per day to the base. The base normally uses one million gallons per day. Although base water usage did not reach 2.5 million gallons in 2004 or 2005, water usage can increase to four million gallons per day during times of heavy irrigation. Two Air Force booster pumps are located at the San Felipe Springs to enhance the city's water pressure as the need arises.

As the sole source for the base, water is pumped from the Del Rio Water Treatment Plant to the base's pumping facility through a 16-inch diameter, six-mile long transit pipe. This pipe was constructed in 1993 and is in excellent condition. Water is stored in a one million gallon aboveground tank, Building 2028, and pumped through Building 2027 to two elevated tanks. The two elevated tanks hold 100,000 gallons and 300,000 gallons, respectively.

The improved areas of the base are watered April through September. Irrigation systems are installed at major facilities such as the Liberty Drive, athletic fields, and golf course, to name a few. The remaining improved areas are watered by garden hoses with portable sprinkler heads.

A well has been installed near the stables, but it does not produce enough water to meet the golf course irrigation needs. The well water, however, does supply enough water to keep the golf course ponds filled. The golf course has its own booster pump, and the pond and the swimming pool provide backup firefighting capability.

Assessment

As shown in Figure 4-13, the water supply system is a looped system with about 35 percent of the mains being steel pipe, ranging in size from 2 to 10 inches in diameter. The remaining 65 percent are transit pipes, C-900 plastic pipes, and polyvinyl chloride (PVC) pipes. These range in size from 4 to 10 inches in diameter. The main distribution system is approximately 35 years old and is in poor condition. Currently the base loses 20% of its domestic water due to leaks throughout the distribution system. Gate valves are presently being replaced as they require repair. The overall base water pressure is insufficient to support current operations. Improvements to the system would be necessary to support future development on base.

A base-wide water distribution study was recently conducted resulting in an overall plan to allow for proactive maintenance and repair of Laughlin AFB's water distribution system. This study included an inventory of the existing system, computer modeling, and corrective measure recommendations. The study identified several deficiencies in the base water supply system, which can be found in the brief summary of the study's findings and recommendations that follows.

Elevated Water Towers

Issues requiring over $11.5M in repairs in the next five years include:

- **Post Indicator Valves (PIV)** – PIVs have above ground posts that indicate whether a valve is open or closed. This is key to ensuring a fire protection system has water flowing to it. Several facilities have in-ground valves, which is a potential safety hazard.
- **Corrosion Control Facility (Building 33) Ground Storage Tank** – The facility's fire suppression system is tied directly into the water distribution system and has two 2,000 gallon per minute (gpm) pumps that, if activated simultaneously, will pump more water than the water distribution system can supply. A proposed remedy to this issue is to construct a 60,000-gallon ground tank near the facility to supply its fire suppression system rather than the base water distribution system supplying it.
- **Water Metering** – Laughlin's water distribution system has problems with improperly located flow meters, as well as an overall lack of such meters. A plan to install flow meters in high usage facilities and to relocate several flow meters is proposed.
- **Elevated Water Tanks** – The radio transmitter used to communicate with the water pump station is inoperable, which results in manual operation to monitor tank levels. This practice places base personnel and property at risk should the tank levels drop below 50 percent. The installation of backup controls is recommended.

- **Water Truck Fill Station** – Current practice for construction trucks needing water is to directly utilize fire hydrants. This can result in unnecessary damage to hydrants with no method in which to monitor water usage. The recommended solution is the construction of a water fill station equipped with electronic access terminals to record contractors and their water usage.

Issues requiring over $1M in expansion to the system should the base increase or redistribute its water demands in the future include:

- **Water Main Enlargements** – Two areas within the water distribution system would lack adequate flow and pressure to fire hydrants should the base expand. Installing larger pipes in these areas would resolve this potential problem.

- **Water Main Looping** – Laughlin's water distribution system has several dead-end points that require periodic flushing. A true looped system eliminates potential pressure problems and the negative water quality issues associated with water stagnation.

Large existing and planned facilities located at the outskirts of the base require large amounts of water to support building fire fighting systems. Facilities falling into this category include Buildings 33 and 454.

As a component of its Energy Conservation Program, Laughlin AFB is seeking alternate irrigation sources for its golf course. The digging of a new well near the stables (Building 3) could potentially provide an adequate supply of gray water to meet this need. Water quality tests indicate that this water source is adequate to support the gray water golf course irrigation plan.

4.3.2 Sanitary Sewer System

Overview

The lagoons have been in existence for more than 10 years. Prior to the present facultative lagoon process, these lagoons were used as detention and polishing ponds before releasing effluent into the creeks. Under this process, two settling basins were used to remove settled solids, which were then pumped into a digester for thickening and finally pumped into a drying bed. The sludge was dried and then disposed at a landfill.

The sewer line from the Flightline facilities at the southeast end of the ramp to the treatment plant has been replaced. The present system consists of a comminutor, which grinds raw sewage prior to entering the treatment plant and a three-pond facultative system. Reuse of effluent for land application is being considered. The system meets state requirements and is shown in Figure 4-14.

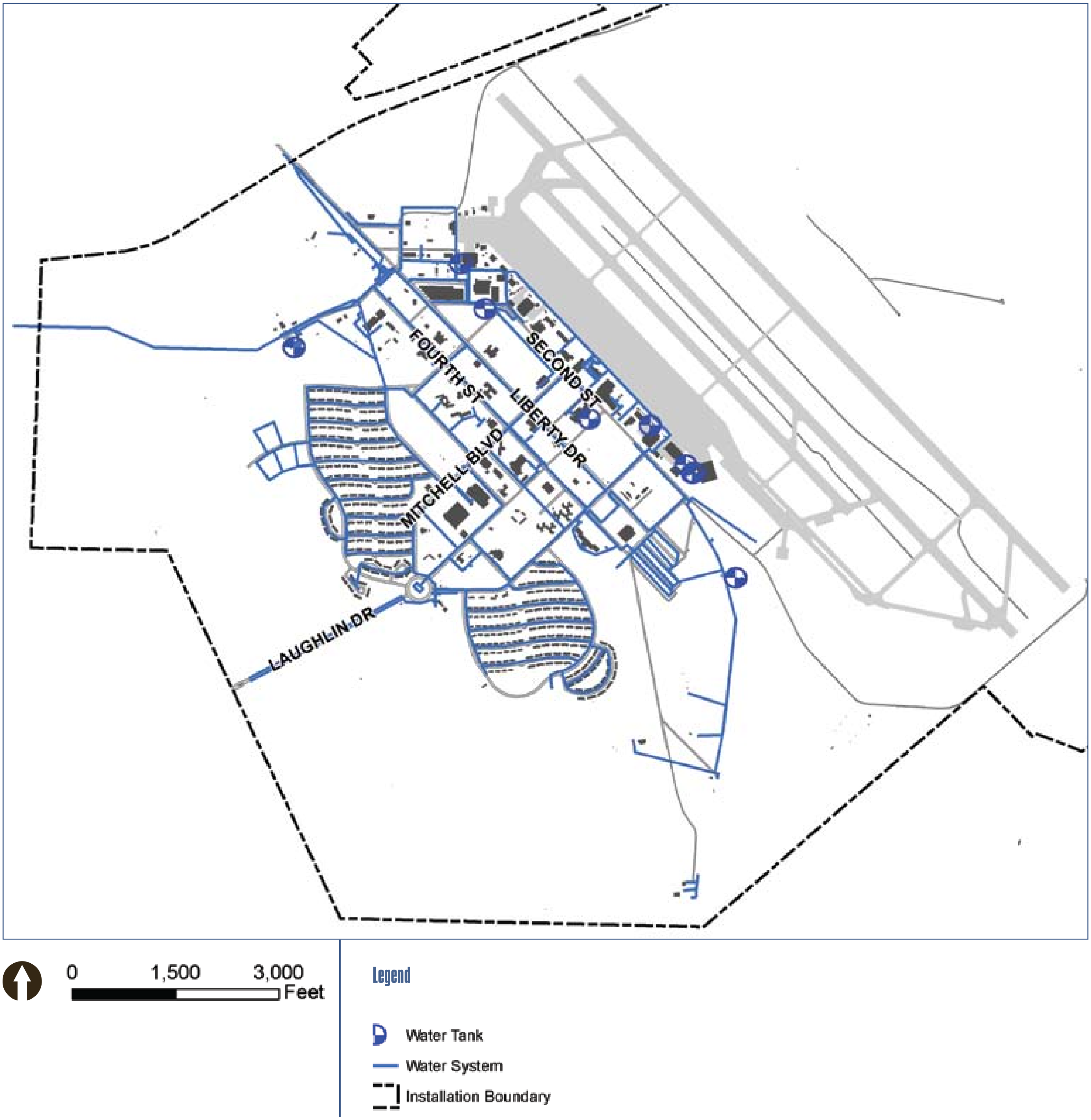
Assessment

Old clay pipes are being replaced with PVC when needed. Lateral lines are in good condition. The physical sewer lines are in good condition overall; however, problems exist due to the poor routing of the pipes. Many pipes have numerous or sharp angles and are prone to grease and debris blockages requiring constant maintenance.

The 14 oil/water separators in the Flightline area are in fair condition and meet state standards. No septic systems are on Laughlin AFB.

While the lagoons are efficient and meet the needs of the base, they attract large bird populations that require mitigation to avoid disturbance of flight training and other Flightline operations.

FIGURE 4-13 Water Supply Map



Sewage Lagoons

Storm Water Channel along Second Street

Storm Water Culverts

Storm Water Culverts

4.3.3 Storm Drainage System

Overview

The storm drainage system (Figure 4-14) is a combination of underground pipes and open drainage ditches. The majority of the underground cement pipes are located along First Area and drain the Flightline and airfield. The cantonment area has a minimal number of pipes for storm drainage. A major feature on Laughlin AFB is the open drainage ditch that parallels the west side of Second Street. This open ditch is intended to catch the high volume of surface runoff from the cantonment area.

Assessment

Although the underground clay pipe system along the airfield and apron is in good physical condition, some problems are experienced during periods of heavy rain.

During rain storms, surface runoff generally flows from the cantonment area east towards the open ditch along Second Street. However, a significant amount of this runoff bypasses the open ditch via the numerous paved vehicle crossings leading from Second Street to First Area and the Flightline. This additional water volume overwhelms the First Area Flightline storm drainage pipes and causes flooding. Two areas along the Flightline where flooding regularly occurs are at the intersection of Liberty Drive and California Avenue and in the vicinity of Buildings 50, 51, and 52. The latter locations can experience severe flooding that water may actually enter the facilities.

A July 2005 Airfield Storm Water Drainage study determined the pipe along First Area and the Flightline is not adequately sized to handle the surface runoff from both the airfield and cantonment area. Additionally, the study determined that First Area and Flightline outflow connection to the Second Street open drainage ditch is not properly located, thus increasing the potential for Flightline flooding.

4.3.4 Natural Gas System

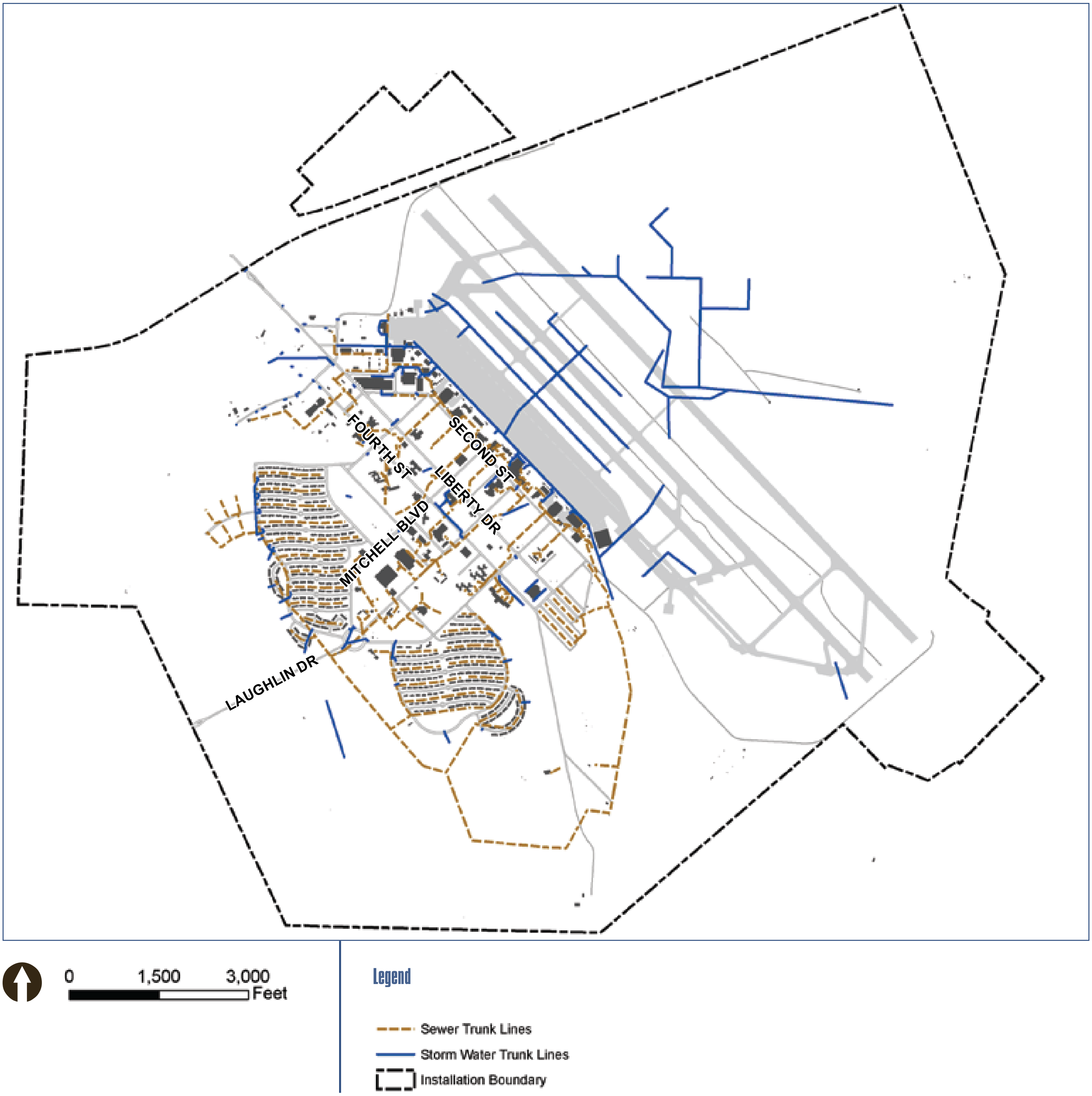
Overview

Natural gas is supplied by the West Texas Gas Company and piped to Laughlin AFB via a six-inch diameter high pressure, steel pipeline. The natural gas supply enters the base at the southwest boundary and is odorized in Building 497 before distribution. The main lines are 2- and 3-inch polyethylene, and the feeder pipes are ¾- and 1-inch polyethylene. Gas pressure is maintained at 19 pounds per square inch (psi) in the winter and 16 psi in the summer. The majority of base facilities use natural gas for heating and hot water. Some facilities such as the Aircraft Weather Shelter use electricity to heat water while a few others use electricity for both heating and hot water. Gas is metered and controlled for major areas. The natural gas system is shown in Figure 4-15.

Assessment

Approximately 90 percent of the natural gas feeder pipes were recently replaced. The largest challenge facing the base is the metering of facilities. Currently only major facilities have meters, which makes it difficult to monitor usage and collect real data for the entire installation. Due to Privatized Housing, an opportunity to meter this area of the base does not exist.

FIGURE 4-14 Sanitary Sewer and Storm Drainage Map



Storm Water Drainage

Storm Water Culverts

Fuel Storage Tanks

4.3.5 Liquid Fuels

Overview

Jet fuel is delivered to the base by commercial tank trucks and stored in three ASTs within the bulk fuel storage area located just inside the main entrance. Two ASTs each have a capacity of 10,000 barrels, and the third AST holds 15,000 barrels. The three tanks are connected to four-point fill stands in both the Bulk Fuels Storage Yard and in proximity to the Flightline at the Fuels Administrative facility (Building 26). The tanks sit on a concrete pad and possess a secondary containment system of berms. Leak detection and cathodic protection systems are in excellent condition. Figure 4-15 shows the location of these tanks. Relocating the fuel operations was not considered in this ADP.

JP-8 fuel is delivered to the Flightline by 6,000-gallon aircraft refueling trucks from a jet fuel fill stand adjacent to Building 26. This project was completed in 2005 and eliminated previous safety and operational concerns associated with having the only fuel fill stand located in the Bulk Fuels Storage Yard.

Assessment

With the completion and activation of the fuel stand adjacent to Building 26 near the Flightline, the liquid fuels system is considered in good condition. However, concerns regarding force protection and the Bulk Fuels Storage Yard still exist. Base fuels personnel located in Building 8 are responsible for monitoring the Bulk Fuels Storage Yard but are located nearly 1,000 feet away from the yard across Liberty Drive and close to one of the base entry gates. Although the support structures for remote surveillance cameras were installed in the yard, cameras were never installed due to a lack of funding. Currently, fuels personnel have no method to continuously monitor the yard's fence line. Another force protection and safety issue results from the manual operation of the Bulk Fuels Storage Yard gate. Current practice requires drivers to exit their vehicles each time they need access to and from the yard.

4.3.6 Electrical Distribution System

Overview

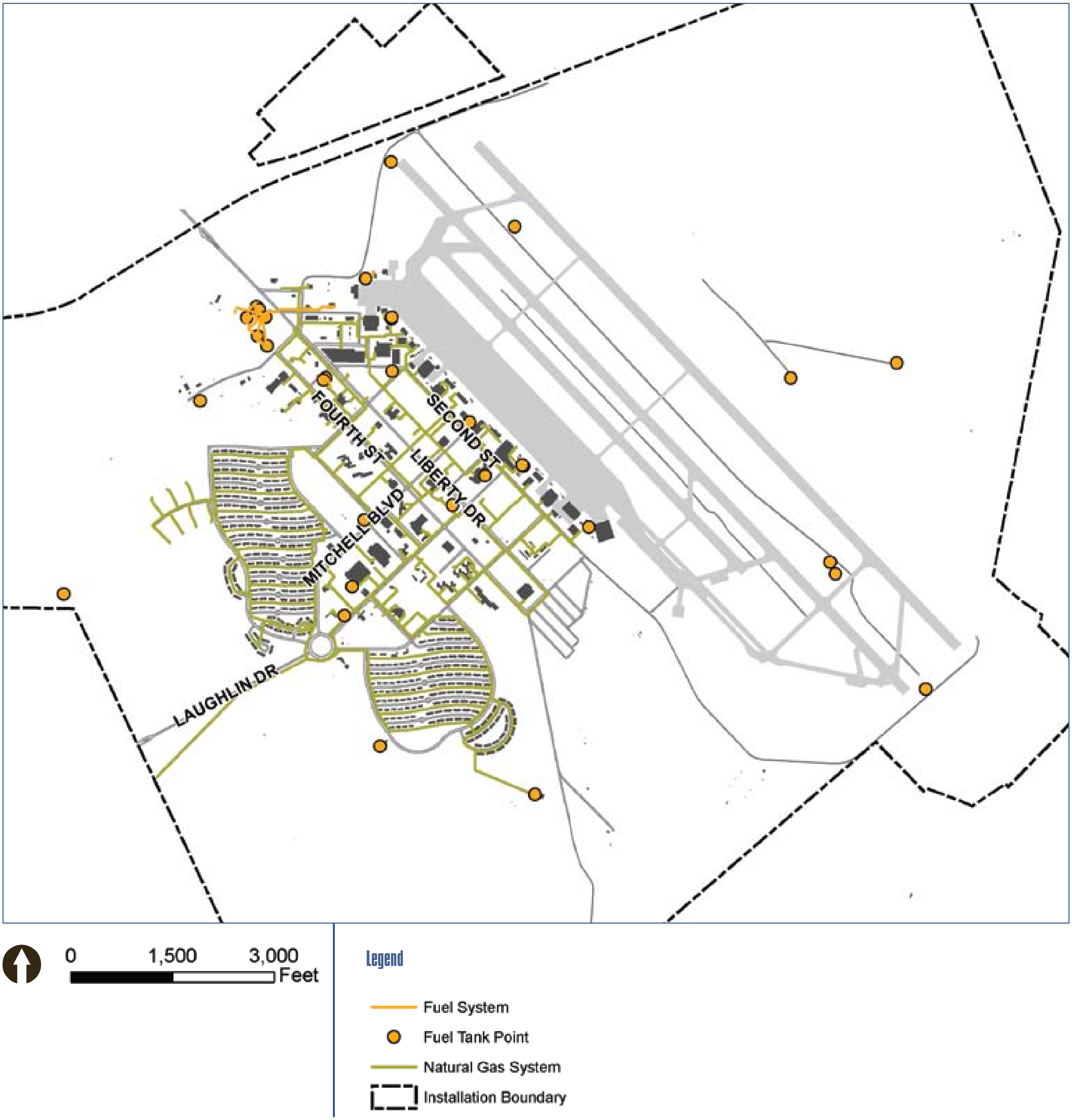
Rio Grande Electric Cooperative provides electricity to the base electrical switch substation by way of two high voltage overhead feeder lines originating from the Hamilton Road substation located outside the base northern perimeter. The base has a looped distribution system with a primary voltage of 7,200/12,480 volts. The majority of the cantonment area is serviced by overhead lines accounting for more than 50 percent of the base's electrical distribution system (Figure 4-16). The Privatized Housing area and the airfield both have underground distribution systems.

Eleven vacuum circuit reclosures (VCR) stations monitor the electric lines and shut down only the portion of the base affected by a problem on a line. This allows generators to continue to provide a backup power supply to facilities considered critical to mission operations.

Laughlin AFB maintains approximately 35 power generators providing backup electricity to mission essential facilities. Generator capacities range from 15 Kilovolt Amps (KVa) to 350 KVa. Seven portable generators provide backup power support flexibility to the base.

The current contracted electrical repair response time is one hour, and it takes an additional two hours for appropriate maintenance assets. The proposed privatization of the base electrical system may have potential impacts on this response time.

FIGURE 4-15 Natural Gas and Liquid Fuels Map



Overhead Power Lines

Assessment

Maintenance records show that Laughlin AFB experiences an average of three to four power spikes or outages each month due to elements such as high winds, lightning strikes, and animal damage (e.g., birds or squirrels on the lines, which grounds the system). An underground electrical distribution system would improve reliability by reducing vulnerability to these elements. Power outages have potential serious impacts on mission performance, especially to mission critical systems such as airfield lighting, the ILS, and localizer. The privatization contract requires the majority of the electrical lines on base to be fixed and maintained, which should decrease the number of power outages.

Metering of the electrical usage is also a problem. Currently only 42 buildings have meters, which makes it difficult to produce real data for energy consumption.

Currently, the Medical Clinic is lacking back up generators and is unable to provide proper medical support during power outages. Emergency power is needed for several reasons, including:

- The pharmacy alarm system must be active at all times.
- Certain medications and vaccines require specific storage temperatures, and they must be destroyed if temperatures fall or rise outside the required range.
- Sedation is used in both the minor treatment and dental room, and emergency power must be available to perform critical functions, such as reviving a patient, during a loss of power.
- Emergency lighting throughout interior halls and rooms do not exist for sufficient visibility.

Pole Away Program

A major constraint to performing continuous operations on Laughlin AFB is its use of an overhead electrical distribution system located throughout the cantonment area. Overhead lines are susceptible to damage from harsh weather, animal activity, and other threats resulting in line breakages and interruption of electrical service. Both the Privatized Housing areas and the Flightline area have underground electrical distribution lines and are protected against these threats. The rest of the base will receive upgrades and be placed underground through the privatization contract.

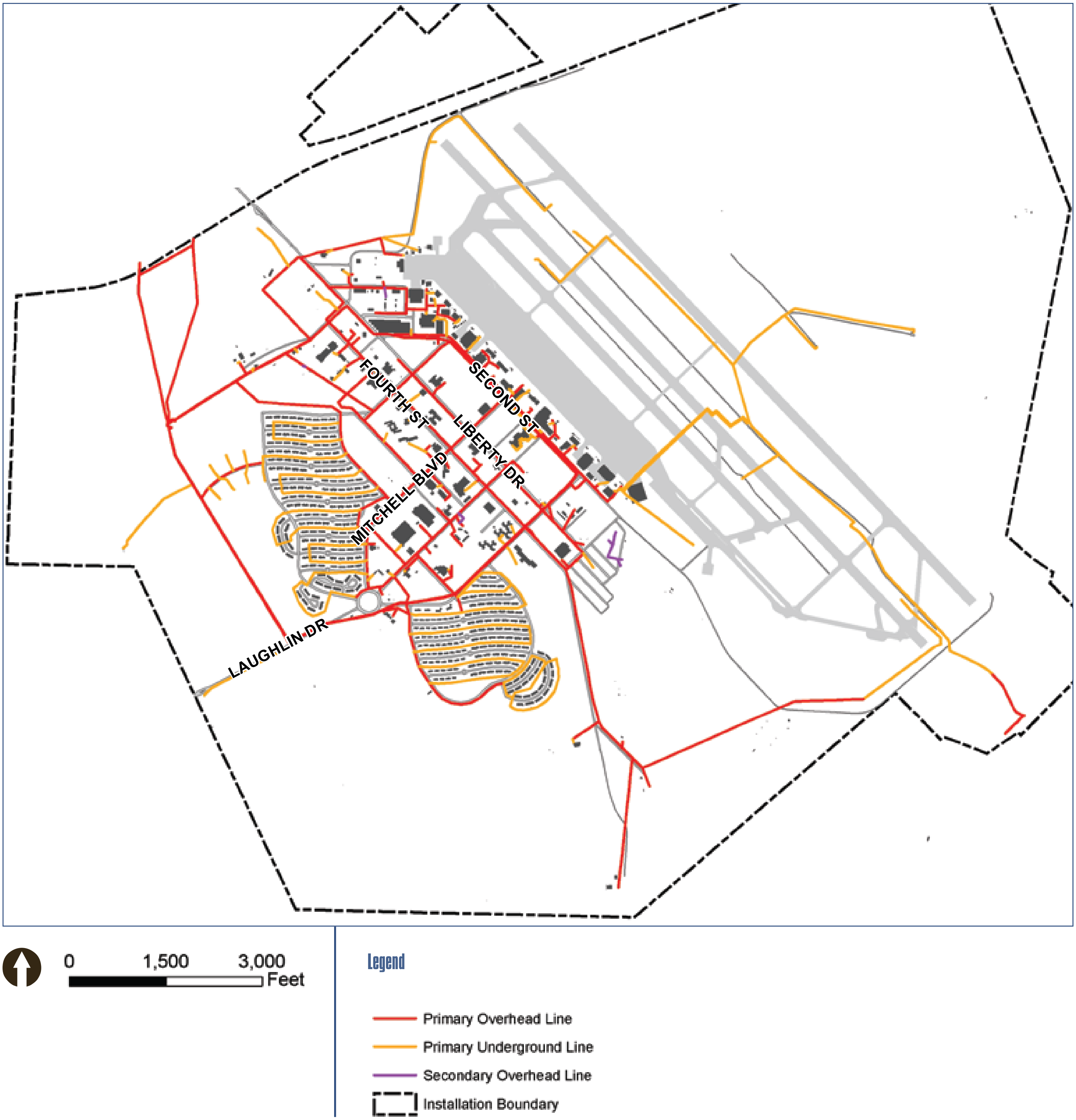
The American Electric Power (AEP) high voltage feeder lines enter the base west of the North Gate and converge at the Laughlin AFB electrical switch substation located northwest of the 8000-series Privatized Housing area along Arkansas Avenue. At the electrical switch substation, electricity is directed to base facilities through four Circuits (A, B, C, and D) (Table 4-5).

TABLE 4-5 Electrical Distribution Circuits

Circuit	Primary Areas Supported
A	9000-series Privatized Housing, UOQs, TLFs, Club XL, wastewater treatment plant, small arms range
B	Medical clinic, numerous facilities along Liberty Drive in the Community Area, several facilities along Second Street south of Building 410
C	Numerous facilities from the North Gate to Building 7 and the north end of the airfield along Second Street, 47th CES facilities south of Arkansas Avenue, enlisted dormitories, 8000-series Privatized Housing, Child Development Center
D	Flight simulator building

Note: Electricity for airfield lighting and equipment is supplied by Circuits A, B, and C.
Source: Del-Jen Project Manager, December 2005

FIGURE 4-16 Electrical Distribution System Map



Between the electrical switch substation and the first voltage controlled resistance (VCR), Circuits C and D traverse undeveloped land along Arkansas Avenue. Due to its low scrub vegetation and stands of trees, this undeveloped land attracts wildlife. Overhead lines located in this area are more susceptible to the negative impacts of harsh weather than lines located in developed areas that are protected by buildings. Therefore, Circuits C and D are considered to be in more danger of damage than Circuits A and B. Accordingly, Pole Away efforts will make moving Circuit C and D lines underground first priority or, at a minimum, moving portions of these lines underground while simultaneously reducing the number of poles on base. Once the electric lines associated with Circuits C and D are properly moved underground, efforts will shift to Circuit A and B overhead lines. For utilities located in the vicinity of, and associated with, new construction projects, locating these elements underground will be part of the facility/project design.

Also included in the Laughlin AFB Pole Away Program are other utilities suspended overhead. Although far fewer linear feet are overhead, over 9,000 LF of copper voice communications lines are still strung between poles. The ultimate goal of the Laughlin AFB Pole Away Program is to improve the base's electrical distribution system reliability and adding system redundancy. An additional benefit to executing the Pole Away Program is the beautification of Laughlin AFB through the removal or limitation of unsightly overhead electric lines and support poles.

Runway Light

Airfield Lighting

Overview

Both the outside and primary runways have high intensity runway lights, while the inside runway is equipped with medium intensity lighting. The outside runway and primary runway have Precision Approach Path Indicators (PAPI). All three runways recently received new lights. Taxiways A, D-1, E, F, and G are lighted.

Assessment

The airfield lighting and vault have been upgraded, but the primary runway (31 Center) does not have the required approach lights for Category (CAT) 1.

4.3.7 Central Heating And Cooling

Overview

No centralized plant facility provides heating and cooling to the base. Each building has an individual chiller run by electricity. Exceptions to the facility-specific chillers include two chiller/boiler plants in the Unaccompanied Housing areas. A chiller/boiler located in Building 244 serves dormitories and an administration building. A second chiller/boiler located in Building 448 serves the UOQ in Buildings 449 and 450.

A new student dormitory HVAC system has been installed. A ground-source heat pump system uses water that has been run through underground piping as a heat sink at approximately 53 degrees F. This will help the facility's chiller/boiler regulate temperatures resulting in fuel and energy efficiencies.

Assessment

Between 2003 and 2008, the base replaced 13 facilities' chillers. An estimated six to eight facility chillers are at the end of their life cycles and will require replacement in the near future.

Installed in 1989, with minor upgrades in 1998, the Energy Management Control System (EMCS) is located in Building 121. The EMCS is connected to 43 facilities, which are tied into the Command Post's Local Area Network (LAN). Although the system is designed to both

monitor and control the heating and cooling of approximately 50 buildings in the cantonment area, obsolete and faulty fiber connectivity results in the system's inability to perform its control function. Unable to repair the fiber lines due to the antiquated technology of the line, benefits of the EMCS design capabilities are lost along one entire trunk. Compounding the obsolete fiber lines are the impacts of line breaks due to facility demolitions. Repairs to the old fiber line are not being made because the fiber line is not available, which results in any benefits of EMCS being lost along an entire trunk.

Throughout the years, Laughlin AFB has been able to replace the old fiber lines with new controllers and upgrade facility controls or new buildings put in place that were put on the LAN. When new facilities or controls are initiated, a new controller is placed and a LAN connection (through Command Post) is requested with an IP address.

One fiber connection runs from EMCS to Building 2027 for the water system. This is not a trunk but is on a N2Bus; from there it picks up a phone line to communicate to the San Felipe Springs system.

All fire alarm systems for heat detection, smoke detections, pull stations, etc., are tied into a central building panel from which they are communicated via FSK (radio transmission) to command post (fire dispatch). The security alarm system is set up very similar to the fire alarm system, with the exception that the security alarms are not on radio; these are on a dedicated phone line.

The EMCS monitors and regulates the chiller/boiler plants, water towers, aboveground water tank, and the Air Force pumps at San Felipe Springs. The EMCS can only monitor and control Johnson and Siemens controls, which should become a standard feature of all future building to develop the most comprehensive monitoring system.

4.3.8 Communications

In 1998 when Laughlin AFB came under the Centralized Information Transport System (CITS) umbrella, the base received an upgraded communications system. These upgrades included a new fiber transport system, new telephone switch, and numerous new network switches for the LAN. The voice and data infrastructure (Figure 4-17) is protected via a manhole/duct system. Laughlin AFB's communications blueprint is available online via the 38th Engineering Installation Group web page. The blueprint is maintained by Laughlin AFB's Base System Telecommunications Engineering Manager (STEM-B) located at Tinker AFB.

Data

Overview

In 2004, the base network infrastructure was upgraded to a Gigabit Ethernet (Gig-E) infrastructure. Currently, the base network utilizes the Internet Protocol Version 4 (IPv4) addressing scheme, with the capability of supporting Internet Protocol Version 6 (IPv6). The base network backbone consists of five core information transfer nodes, feeding approximately 120 network switches located across the base. These switches are connected via approximately 123,000 feet of underground fiber. This backbone provides unclassified and classified data connectivity to base users.

Assessment

The current backbone is capable of supporting future growth and technology needs with minimal upgrades. There are still several outlying buildings that require ductwork and/or fiber/Cat 6 copper.

Voice

Overview

Laughlin AFB's current telephone switch configuration consists of one Meridian switch located in Building 339 and serves as the main switch for the base. A Protel key system, located in Building 454, services base lodging facilities. Approximately 272,000 feet of copper cable provides voice connectivity, of which 9,481 feet is above ground. All cable was relocated below grade by 2007. Laughlin AFB currently utilizes a Trunked Land Mobile Radio System (TLMR) consisting of handheld radios, base stations, consolettes, and repeaters.

Assessment

Voice over IP is to be implemented soon. Also, a new Dial Central Office is required as the current facility has a cable vault at maximum capacity. Future growth of the base cable plant is prevented due to the absence of adequate room for expansion.

Flight Support Systems

Overview

Laughlin AFB currently has a modern airfield infrastructure.

4.3.9 Pavements

Base Pavements

Overview

Laughlin AFB has approximately 60 miles of streets and roads. About 25 miles of streets are asphalt, with the remaining roads composed of gravel or dirt.

Assessment

As with most asphalt surfaces, the pavements quickly show signs of degradation. Ultraviolet rays change asphalt pavement from black to light gray indicating deterioration. This deterioration is inevitable, especially in the intense sun and heat of southwest Texas. However, deterioration may be slowed with proper preventative maintenance (e.g., sealing). With the new 2010 Six-Year Plan for Pavements, focus has been on smaller-scale pavements projects.

Airfield Pavement

Overview

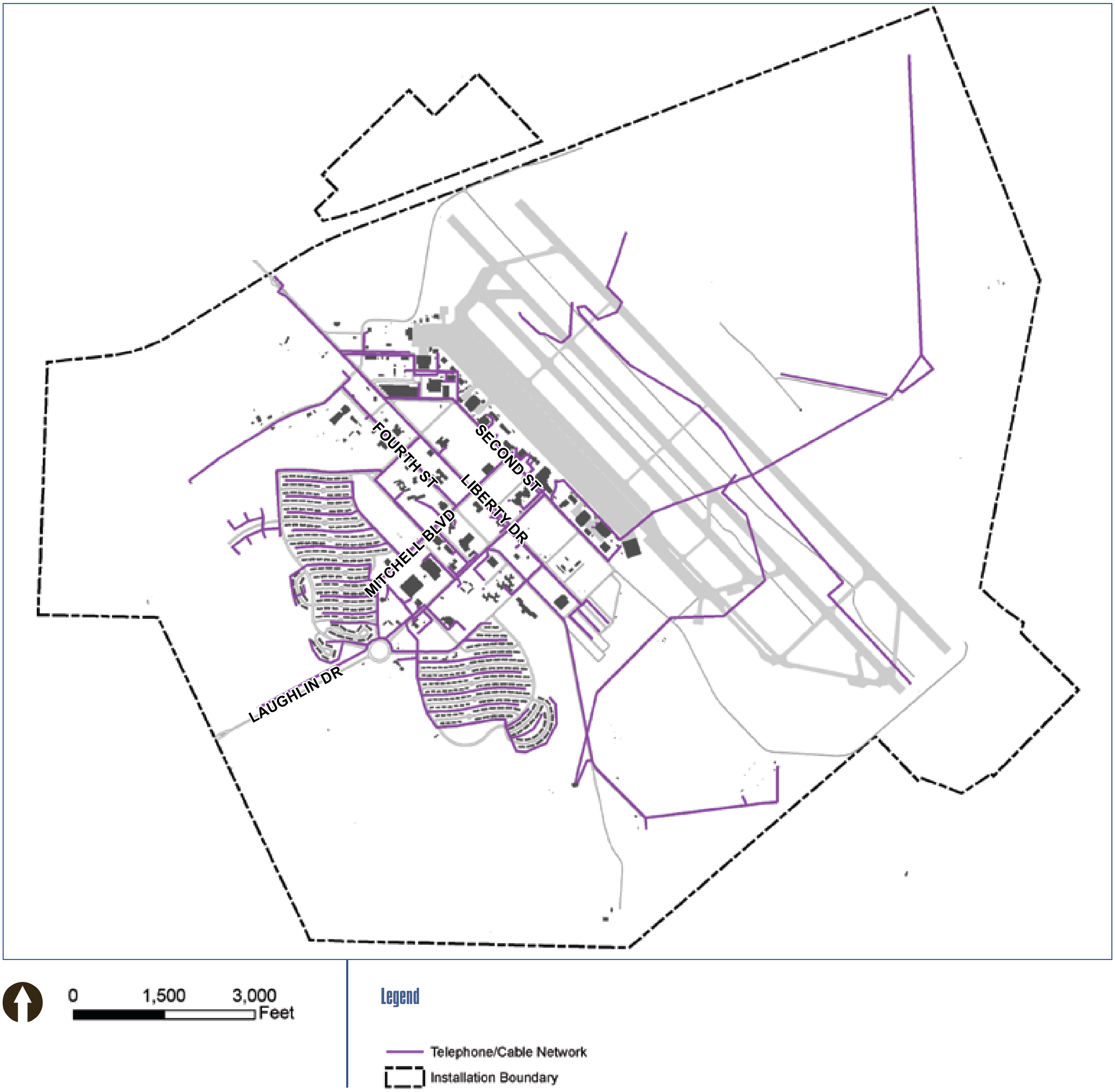
Runway pavements and some taxiways are asphalt concrete, while parking aprons are concrete. The total paved area of the airfield is about 226 acres and consists of:

- 13L/31R, Outside Runway 29 acres
- 13C/31C, Primary Runway 31 acres
- 13R/31L, Inside Runway 21 acres
- Taxiways 85 acres
- Aprons 60 acres

Laughlin AFB has three parallel runways that are oriented northwest-southeast.

The longest runway is located in the center and is the only runway equipped with ILS. This is an all weather runway, measuring 8,858 LF. The outside runway measures 8,310 LF, and the inside runway measures 6,246 LF. All three aircraft types found at Laughlin can use the center runway. T-38Cs primarily use the center and outside runways while the T-6As mainly use the inside runway.

FIGURE 4-17 Data and Voice Systems Map



Asphalt Roadway

Asphalt Runway

Concrete Parking Apron

Concrete and Asphalt Pavements on Airfield

Laughlin AFB is responsible for training one-third of the Air Force's pilots annually. Laughlin's RAPCON was ranked the 4th busiest in the Air Force controlling over 211,000 movements. The Tower was ranked the 9th busiest in the Air Force controlling over 92,000 movements. Laughlin AFB became as busy or busier with the addition of IFF to Laughlin AFB's mission. This mission added 15 T-38Cs and 14 T-6As to the mission.

Assessment

It is estimated that the amount of pavement work has tripled in the past eight years. The airfield pavement system will continue to support T-1A, T-6A, T-38C, and the T-38C replacement (T-X aircraft) training mission without restrictions. An airfield pavement evaluation was conducted by the Air Force Civil Engineer Support Agency (AFCESA), Tyndall AFB, in January 2010. Laughlin AFB is awaiting the results of this evaluation.

Many of the airfield pavements are over 30 years old, and repair is a high priority. All three runways have been repaved within the last 10 years; however, the center runway overrun has not been repaved and is in need of repair. All runways have been grooved to facilitate water runoff.

Some maintenance projects are needed on the taxiways. The taxiways and the center and inside runways do not have shoulders.

Laughlin AFB's aircraft parking apron pavements are repaired by replacement. The biggest concerns are the joints, vegetation in joints and cracks, spalling, and rubber accumulation. Joint sealing on the T-6A and T-38C ramps is deteriorated in places with occurrences of cement pads being uneven. Generally, apron pavements are aged and deteriorated with some aprons structurally weak, as well as having poor drainage and improper pavement repairs.

Two major AOCs are the sterile aircraft lane along Taxiway Golf and runway supervisory unit (RSU) road Lariat located between the center and outside runways. This road is heavily used by RSUs, maintenance vehicles, and taxi drivers transporting air crews to the center and outside runways. These pavements are in need of serious repair.

It is difficult to replace and repair airfield pavements without interrupting the flying mission. Construction and repair on the weekends or after flying hours is more expensive and raises project costs.

4.3.10 Fire Protection

Overview

Built in 1995, a state-of-the-art fire station located on the Flightline serves both the Flightline and the base. A project was completed in 2005 that added crew quarters to this station. Except for Buildings 52 (Non-destructive Inspection Laboratory) and 53 (Aircraft Fuel Systems Maintenance), all facilities in the cantonment area are protected by fire detection and/or fire suppression systems (sprinklers) that are wired directly into the fire station. Privatized Housing also has smoke and carbon dioxide detectors. Building fire suppression sprinkler systems have hose connections on the outside of the facilities. Once on the scene of a fire, the fire department augments the building's base-supplied sprinkler water through building external water hookups and hoses connected to their pumping trucks. These additional connections increase the overall water pressure in the building's sprinkler system.

A one million-gallon aboveground tank and two elevated tanks are used for firefighting purposes on base, while tanks situated near the facility are used for fire suppression systems in hangars. Hangars 1 and 3 recently had high expansion foam fire suppression systems installed. The golf course lake and swimming pool also serve as backup sources of water.

Firefighters have both aircraft and structural training facilities. The fire training pit is currently located south of the aircraft weather shelter and aircraft parking apron.

The Fire Department meets all DoD response time requirements.

Assessment

With increased AT/FP standoff distances, obstacles prevent fire fighting vehicles from getting close to the some buildings, resulting in increased response times associated with the need to unroll additional hose from the trucks to reach buildings. Also, extended water hose taxes the pumping truck systems trying to maintain adequate water pressures in the hoses.

Although the water supply infrastructure is adequate for firefighting, a majority of the installation's 78 fire hydrants were constructed in 1953. Various hydrants are currently in need of replacement.

Projects to install a sprinkler and high expansion foam fire suppression in Aircraft Fuel Systems Maintenance facility, a sprinkler fire suppression in Non-destructive Inspection Laboratory, and a high expansion foam fire suppression in Building 210 (Hangar 2) will introduce/modernize fire protection equipment and are needed to meet Air Force Engineering Technical Letter requirements.

A fire truck obstacle course is also needed for certification.

Fire Station

4.4 LAND USE AND TRANSPORTATION

4.4.1 Land Use

A land use plan for an AFB provides direction for locating future construction and improvements. Collocating similar functions and separating incompatible land uses improves the appearance, quality of life, and functional efficiency of the installation. To avoid conflicts, the land use plan for Laughlin AFB should recognize documented land use controls and be compatible with the land use plans and goals of the surrounding community.

The purpose of the land use component of this General Plan is to guide the future development of Laughlin AFB. To provide this guidance, the plan identifies desired functional relationships and analyzes these relationships among the units and activities assigned to the installation. Possible solutions are examined within the constraints on and around the installation. This is done to mitigate any incompatibility among existing uses and to allocate the land necessary to support ongoing and projected operations. The following categories are based on Air Force Standards and the AFPAM32-1010 Land Use Planning pamphlet completed in 1998.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as Superfund, set forth requirements for Land Use Controls based on the Records of Decision, as well as other measures intended to protect against exposure to soil, groundwater, sediment, and surface water impacted by historic releases of contaminants.

An installation's operations and its associated land use types significantly impact the use of base-owned property. Table 4-6 lists each land use category and the associated amount of land. Figure 4-18 illustrates the existing land uses on Laughlin AFB, and descriptions of these land uses are described below.

TABLE 4-6 Land Use Categories

Land Use Category	Land (Acres)	Land (SF)	Designed Total (Percent)	Actual Land (Percent)
Airfield	162.70	7,087,212	8.01	3.98
Aircraft Operations and Maintenance	54.10	2,356,596	2.66	1.32
Industrial	186.55	8,126,118	9.19	4.57
Administrative	18.30	797,148	0.90	0.45
Community Commercial	52.70	2,295,612	2.60	1.29
Community Service	11.70	509,652	0.58	0.29
Medical	9.30	405,108	0.46	0.23
Residential	201.30	8,768,628	9.91	4.93
Outdoor Recreation	215.40	9,382,824	10.61	5.27
Open Space	1,118.25	48,710,970	55.08	27.37
TOTAL (Designated) *	**2,030.30**	**88,439,868**	**100.00**	
TOTAL (Actual) **	**4,086.30**	**177,999,228**		**49.69**

Source: Laughlin AFB-supplied GIS Data
** Total (Designated) = Total Land Assigned an Attribute*
*** Total (Actual) = Total Installation Acreage*

Airfield

On most Air Force installations, the airfield is not only the dominant land use, or 25-40% of total base area, but is usually the very reason for the existence of the installation. The size and configuration of an airfield largely depend on topography, climate, meteorological factors, land availability, and weapons system characteristics.

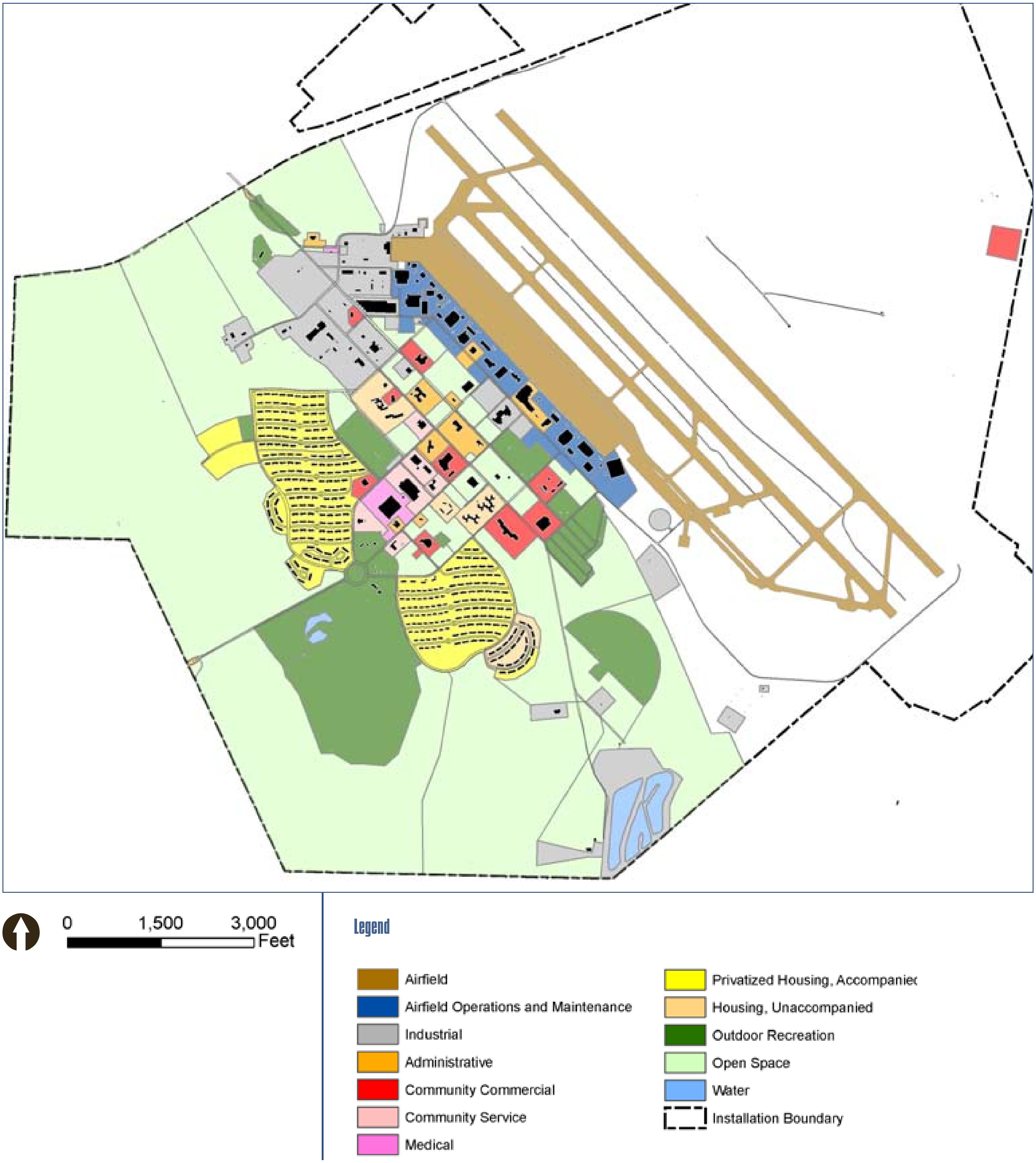
The airfield land use consists of the entire airfield pavement system (runway, taxiway, and apron), related open space, navigational aids, and all imaginary airfield and airspace clearance surfaces. Facilities in this category include the runway, overruns, taxiways, aircraft parking aprons, arm/disarm pads, and dangerous cargo pads. Areas falling within the designated Clear Zones are also identified by this category.

Airfield pavements total 226 acres of the total airfield land use categories. Runway pavements and some taxiways are asphalt, while parking aprons are concrete. Clear Zones and APZs extend northwest and southeast from the ends of all runways past the base boundaries.

Constraints exist in the Airfield land use areas of the base. The T-38C aircraft usually uses the outside runway for take-offs, while the T-1s usually use the center runway. The T-1s, however, sometimes use the outside runway for departures. Of the three types of training aircraft at Laughlin AFB, the T-38C requires the most runway length to accommodate emergency take-off procedures, such as taking off with only one engine. The current lengths of Laughlin's runways do not adequately support this.

The prevailing winds at Laughlin AFB come from the southeast. Accordingly, aircraft land and take-off into the wind, which means from north to south. T-38C movements to and from the center and outside runways are constrained by T-6As taking off or landing on the inside runway. Congestion at the intersection of Taxiways G/G-1 and A is a common occurrence for both T-38Cs and T-1s attempting to access the center or outside runways for take-off from the north. Aircraft are restricted from crossing under landing T-6As. Additionally, T-6As must conduct runups on Taxiway G-1 prior to take-off, which contributes to the congestion at that taxiway intersection.

FIGURE 4-18 Existing Land Use Map




Aircraft Operations and Maintenance


Aircraft Operations and Maintenance

Aircraft Operations and Maintenance

This category comprises all facilities that directly support the flying mission. It is generally comprised of aircraft facilities supporting the repair, maintenance, or operation of aircraft. These facilities include hangars, engine and avionics maintenance shops, base operations, flight squadron operations facilities, the base fire station, and the air traffic control tower. At Laughlin AFB, these facilities are located primarily between Second Street and the aircraft parking apron. These facilities are spatially separated from the medical and housing land uses, which is appropriate.

Constraints for the Aircraft Operations and Maintenance land use relate to the facility locations and their functional relationships as they pertain to supporting the mission requirements. Except for the location of T-1A aircraft parking, the facilities are currently arranged to ensure the efficient operation and maintenance of the existing aircraft fleet and base training mission. Functional relocations, as well as facility additions/alterations will be needed to ensure building structures and facility locations are adequate to support Laughlin's mission. Future development of Aircraft Operations and Maintenance facilities along the Flightline is constrained to the northwest due to the locations of Laughlin's Industrial facilities. However, ample developable land is available southeast of the weather shelter to construct future Aircraft Operations and Maintenance facilities. Although currently constrained by the inside runway CZ, the munitions area, and the compass calibration pad, these parcels offer valuable Flightline access for future facilities.

A number of facilities within the Aircraft Operations and Maintenance area are inadequate to support the Wing's mission. To enhance efficiency, protect aircraft and meet safety requirements, several Airfield Operations and Maintenance facilities will need projects, including:

- Erect sunshades over aircraft parking areas where feasible.
- Replace concrete on apron parking rows W, X, and Y followed by parking rows U and T, A through J, and all of First Area.
- Install a high-expansion foam fire suppression system in Buildings 52, 53, and Hangar 2 (Building 210) to protect Flightline assets and T-38C aircraft.
- Construct a 450-foot extension to the munitions maintenance/inspection bay (Building 905).
- Install doors to the entrance of the Weather Shelter.
- Construct an AGE parking, washing, and servicing area.
- Extend T-1 and T-6 flight shacks (Buildings 216 and 405).
- Modify Hangar 1 to accommodate a J85 Engine Repair Shop (Building 50).
- Add change room and washing capability to Building 58.
- Repair/replace roof at the Aircraft Fuel System Maintenance facility (Building 53).
- Reconfigure aircraft parking row CC to accommodate an additional aircraft parking space.

Industrial

This category includes warehouses for various base activities, base maintenance, and utilities functions, along with base industrial services, such as those belonging to transportation, communications, and civil engineering. They ordinarily fall into the following groups: base supply and equipment complex, fuel-related facilities, vehicle maintenance/motor pool complex, base civil engineer complex, open storage, utilities (infrastructure), emergency/disaster response facilities, ordnance and weapons storage areas, and other industrial uses, such as photo lab, test cell, field training detachment, etc. Industrial facilities on Laughlin AFB are primarily located adjacent to and northwest of the Aircraft Operations and Maintenance facilities. Facilities classified as Industrial include utilities, maintenance, CES facilities, fuel storage, communications, logistics storage, base supply facilities, fire training facilities, munitions storage, and railway facilities.

The locations of Laughlin's Industrial facilities are appropriate given the functional relationship and compatibility between them and the adjacent Aircraft Operations and Maintenance land use. However, Liberty Drive, a main vehicular artery leading to and from the base's North Gate, runs through the middle of the Industrial area. As such, the Laughlin Industrial area is the first area observed upon entering the base and promotes a negative first impression. The areas immediately inside the North gate and along the key base access road are prime locations to make a positive impression on visitors and personnel.

Air Traffic Control Tower

Future Industrial area development is landlocked to the southeast by Aircraft Operations and Maintenance facilities and to the east by the runways. Although open space is available to the west and north, care should be taken to limit Industrial development towards the Privatized Housing area and Enlisted dormitories. This open space is a necessary buffer between Industrial and Residential land uses. All efforts should be made to maintain the Industrial area's current footprint.

Due to the type of training conducted at Laughlin AFB, several facilities classified as Industrial are used for student training and coursework (e.g., classrooms). These facilities include Anderson Hall (Building 320), the Flight Simulator facility (Building 328), and the Aerospace Physiology facility (Building 380). As a result, the classification of these training facilities as Industrial is not appropriate for Laughlin AFB. These facilities are more closely related to the Administrative land use and will require additions or alterations to accommodate the added mission requirements.

T-6A Weather Shelter

Administrative

Administrative areas are the office complexes on an installation. The administrative land use category takes in wing/group headquarters, civilian personnel, training/school, and similar office type activities. It also covers security police operations control, including gate/visitor management and military operations security. The majority of these facilities are located in the center of the base. This central location allows adequate access to and support of all areas of Laughlin AFB.

47th Flying Training Wing Headquarters

Laughlin AFB has taken strides to create a Campus Center anchored by a new 47 FTW Headquarters, also known as the Consolidated Wing Support Facility. The campus is centered on Heritage Park, an area used for graduation and ceremonial events. This open area provides a focal point for the campus and provides a visual corridor between the Wing Headquarters, the air traffic control tower, and the Flightline. Focusing on the creation of a traditional campus environment, the Campus Center includes ample pedestrian malls and access to the flight simulator building, the multi-squadron training classrooms in Anderson Hall, the new Education Center, and the Student Activity Center. The Student Activity Center will include a student union, First Term Airmen Center, and the library. Adequate space is available to accommodate future training demands.

A key opportunity within the Administrative land use area is the availability of developable land. Land parcels in this area are of sufficient size to accommodate functional complexes, not simply single facilities.

47th Installation Support Squadron Building

Community

Facilities in this category comprise the service part of community support and form the "town center" of an Air Force installation. Facilities include the BX, Commissary, clubs, and dining halls. It also includes personal services, such as barber shops, many indoor recreational facilities, schools (nursery, elementary, junior high, and high school), adult education facilities, post office, library, child care center(s), youth center, chapel, and religious education facilities.

Commissary

Base Exchange

Club XL

Community Commercial

Community Commercial facilities at Laughlin AFB include Club XL, Club Amistad, Bowling Center, Recreation Center, Fitness Center, Commissary, BX, Base Shoppette, and Information, Tickets, and Tours (ITT). With the exception of the Recreation Center, which is located next to Industrial land uses, the majority of Laughlin's Community Commercial facilities are properly separated from the incompatible land uses Industrial and Aircraft Operations and Maintenance. Other Community Commercial facilities are dispersed throughout the cantonment area and are clustered in small groups, easily accessible by military personnel and family members.

The number of on-base dining facilities reflect the size of Laughlin AFB's population and include Silver Wings, Jack's Place, Burger King, and Club XL. The dining facilities do not offer highly nutritious meals, nor do the hours of operation accommodate breakfast or weekend hours. For these reasons, student pilots frequently travel (fifteen minutes one way) to downtown Del Rio for meals, which is an inefficient use of time due to the training schedule.

Dining on Laughlin AFB is particularly challenging on weekends when many students travel to San Antonio. The diminished on-base weekend population is not able to support the costs associated with operating a dining facility, leaving all on-base personnel without personal transportation at a disadvantage.

Constructed in 1953, Club XL is one of the oldest facilities on Laughlin AFB. This facility requires constant and costly maintenance. Club Amistad, built in 1956, is underutilized and requires substantial renovations to its kitchen area.

The Fiesta Center was used for training and is now condemned for water damage and wire intrusion. Constructed in 1960, the center is now vacant and requires demolition.

The Bowling Center was constructed in 1961 and renovated in 2010. Renovations included new paint, floors, counters, and bowling lane repairs. It is considered to be in good condition.

The Laughlin AFB Fitness Center was constructed in 2004. It is a state-of-the-art facility and is adequate to support both current and future missions.

Community Service

As with Community Commercial facilities, the locations of Laughlin's Community Service facilities provide easy access to customers. These facilities include the Child Development Center, Youth Center, Library, Post Office, and Chapel.

Medical

This category includes the clinic, base commercial equipment hospital maintenance shop, medical storage, and the veterinary care facility. The Red Cross may also be sited with this land use.

The primary medical facility on Laughlin AFB is the Medical Clinic, which is properly located near both Housing and Community land uses. The Medical Clinic is considered to be in good condition and has had a major renovation; however, three primary areas are approximately 30 years old. These areas still require renovation to meet safety and functionality requirements. Additionally, the entire clinic requires minor remodeling to enhance patient flow.

The Aerospace Physiology facility is located in Building 380 adjacent to the Medical Clinic. Although staffed by medical personnel, the Aerospace Physiology facility is used to train student pilots. Since it is a training facility, this building would be better located within the Campus Center near the Flightline and classified as an Administrative land use.

Residential

This category includes both accompanied housing (for enlisted and officer families) and unaccompanied housing (for bachelor officer housing, airmen's dormitories, and visiting officer and airman's quarters). This land use consists of the following types of housing: Privatized Housing, Airmen dormitories, TLFs, and TLF support. Privatized Housing developments and TLF can take many forms. These include the traditional arrangement with individual dwelling units, duplexes, cluster and planned unit development, mixed-use development, among others.

Laughlin AFB's Privatized Housing is located on the west side of the installation separate from incompatible land uses such as Industrial and Aircraft Operations and Maintenance.

Laughlin AFB's Military Family Housing (MFH) was privatized in 2006 and is now operated by a Privatized Project Owner. In addition, any required construction, demolition, and/or renovations are projected to be completed by June 2010. Under this program, the base:

- Conveyed 534 units and leasing 166 acres for 50 years
- Leased six acres during initial development
- Conveyed all Privatized Housing infrastructure systems such as streets and associated improvements, utilities, and playgrounds and recreation areas

The Privatized Project Owner will:

- Provide 451 adequate homes through construction, replacement, or renovation
- Dispose up to 84 surplus units
- Own, operate, maintain, and manage the Privatized Housing units for 50 years

Unaccompanied Housing at Laughlin AFB consists of Enlisted Dormitories and UOQ. Currently, 200 officer dormitory rooms are located in Buildings 446, 449, and 450. Building 446 houses 56 persons, Building 449 houses 120 persons, and Building 450 houses 80 persons. Constructed in 1980, these facilities were designed as efficiency apartments. Undeveloped land parcels are available adjacent to Buildings 449 and 450 to support future officer dormitories.

Although they are not typically used as dormitory facilities, 21 Privatized Housing duplexes have been converted to officer dormitories. These units can house two personnel per side for a total of 84 personnel. Unaccompanied Housing and Accompanied Housing land uses are normally separated; although, they are designated as compatible. When completed, the Student Officer Quarters project will remedy the unaccompanied officer billeting shortage.

The primary existing Permanent Party Enlisted Dormitory campus area is centrally located within the base, proximate to a majority of the community facilities. Constructed in 1984, Building 256 houses 108 unaccompanied personnel. Although currently in fair condition, the facility lies within the required force protection standoff distance and was recommended in the Laughlin AFB Dormitory Master Plan for long-term replacement. Constructed in 1983, Building 255 houses 156 unaccompanied personnel and is proposed for renovation/replacement. Similar to the officer dormitory campus, undeveloped land parcels are available in close proximity to the existing enlisted dormitories to support additional dormitories.

A 96-person dormitory to be located in the vicinity of the existing enlisted dormitories is programmed, but it is not yet funded. This one building will replace both of the existing enlisted dormitories.

Sidewalks throughout Privatized Housing

Residential Street

Privatized Housing

Shared Space in Residential Area


Unaccompanied Dormitory Housing


FAMCamp


Pool


Playground

The officer and enlisted dormitory complexes are spatially separated, each near its respective club. However, they are all in close proximity to Community Commercial and Community Service facilities.

Outdoor Recreation

Three basic types of outdoor recreation spaces are identified within this General Plan:

- Neighborhood "Pocket" Parks, which are low-density outdoor recreation areas feature activities that engage a very small number of people at one time. They need little or no facilities support, and require little, if any, land disturbance.
- Passive Recreation Areas are areas that allow for outdoor activity to occur in an unorganized manner and can include picnic areas, jogging paths, etc.
- Active Recreation Areas, which serve activities that involve a large number of people at one time. Examples include golf courses, swimming pools, tennis courts, and parks.

Outdoor Recreation land use areas on Laughlin AFB include the Leaning Pine Golf Course, FAMCamp RV Park, several baseball/softball fields, a paintball field, an outdoor skeet shooting range, a multi-sport track and field complex, numerous family playgrounds, and a pool. These areas are dispersed across the base with the majority residing close to the Privatized Housing areas.

Laughlin AFB offers off-base Outdoor Recreational opportunities at the South Winds Marina on Lake Amistad. This recreation area offers a variety of outdoor activities from boating and fishing to picnic areas and campgrounds.

Open Space

This category of land use both separates and defines the various sections of the base, and creates the natural setting for all facilities. It can add immeasurably to a site's attractiveness.

Laughlin AFB maintains Open Space to provide a buffer between incompatible land uses, to preserve land for future development, to protect airfield safety zones, and to protect security and Q-D standoffs. The largest parcels of Open Space are located along the western boundary and run from the north perimeter fence to the south perimeter fence. Other Open Space areas are located south and east of the Privatized Housing area and provide buffers for the skeet and small arms ranges. As development continues and Laughlin's mission increases, planners should strive to incorporate Open Space buffers between incompatible land use types wherever possible.

4.4.2 Transportation

Off-base Land Use Transportation System

Most of the land surrounding Laughlin AFB is within Del Rio's three-mile ETJ, which relates to the City's ability to regulate subdivision plats and issue related permits.

Designated in 1998 as a high priority corridor by the Transportation Equity Act for the 21st Century (TEA-21), the "Ports-to-Plains" corridor will utilize US 90 to connect the states of Texas, New Mexico, Oklahoma, and Colorado with Mexico and Canada. As a primary trade route for NAFTA, traffic volumes along the corridor are expected to increase by approximately 12 percent above normal growth, with truck usage increasing by 10 percent. The Ports-to-Plains Corridor Development and Management Plan recommends a reliever route be built east of the City of Del Rio. The precise location of the reliever route will be of interest to the installation in order to protect connectivity to the base, operations, and mission critical land uses.

On-base Transportation System

Access to the installation is provided by two established gate areas. As the primary entrance, the North Gate is located on the north side of the cantonment area on Liberty Drive. This gate is open 24 hours a day and serves as the primary gateway for visitors, base personnel, and fuel trucks from US 90, the major highway link to Del Rio and San Antonio. The North Gate experiences congestion during the morning and evening peak hours when base personnel are entering/leaving the base. To compound this problem, vehicles must traverse the Union Pacific Railroad line, which moves 22 high-speed trains by the base each day. The State of Texas constructed a dedicated 1,000-foot turn lane from US 90 into the North Gate to help move inbound vehicles off the highway. However, congestion continues to be a problem at the North Gate resulting from limited queuing space due to the gate's proximity to the railroad tracks. The location of the tracks also presents safety concerns as trains could potentially block the primary access point to the installation, thus limiting the access or egress by emergency response vehicles.

The West Gate, a secondary entrance to the installation, is only open during peak hours to relieve congestion at the North Gate. This gate provides direct access to the Privatized Housing areas and the golf course. Approximately 15 percent of the off-base employees use this gate during peak hours. School buses also use the West Gate to pick up and drop off children.

The primary road system brings vehicles onto base and moves them to operations, industrial, administration, community, and housing land uses. Liberty Drive, Second Street, and Fourth Street are the primary north-south streets. Laughlin Drive and Mitchell Boulevard are the primary east-west streets. A secondary road system further routes vehicles to places of employment, recreation, commercial, dormitories, and Privatized Housing uses. The existing road system is illustrated on Figure 4-19.

The road system is adequate, and most base facilities can be reached within 15 minutes from either gate. Traffic conflicts periodically occur along Liberty Drive at Alabama Avenue, Arizona Avenue, Kansas Avenue, and Arkansas Avenue. These streets are all closely spaced and intersect Liberty Drive at less than 90-degree angles. The convergence of Colorado Avenue, Second Street, and California Avenue at one point create a poorly designed intersection.

Although not always located as close to work sites as some personnel would prefer, ample parking exists throughout the base. On-street parking is being eliminated as part of a base program, and most facilities have off-street parking lots.

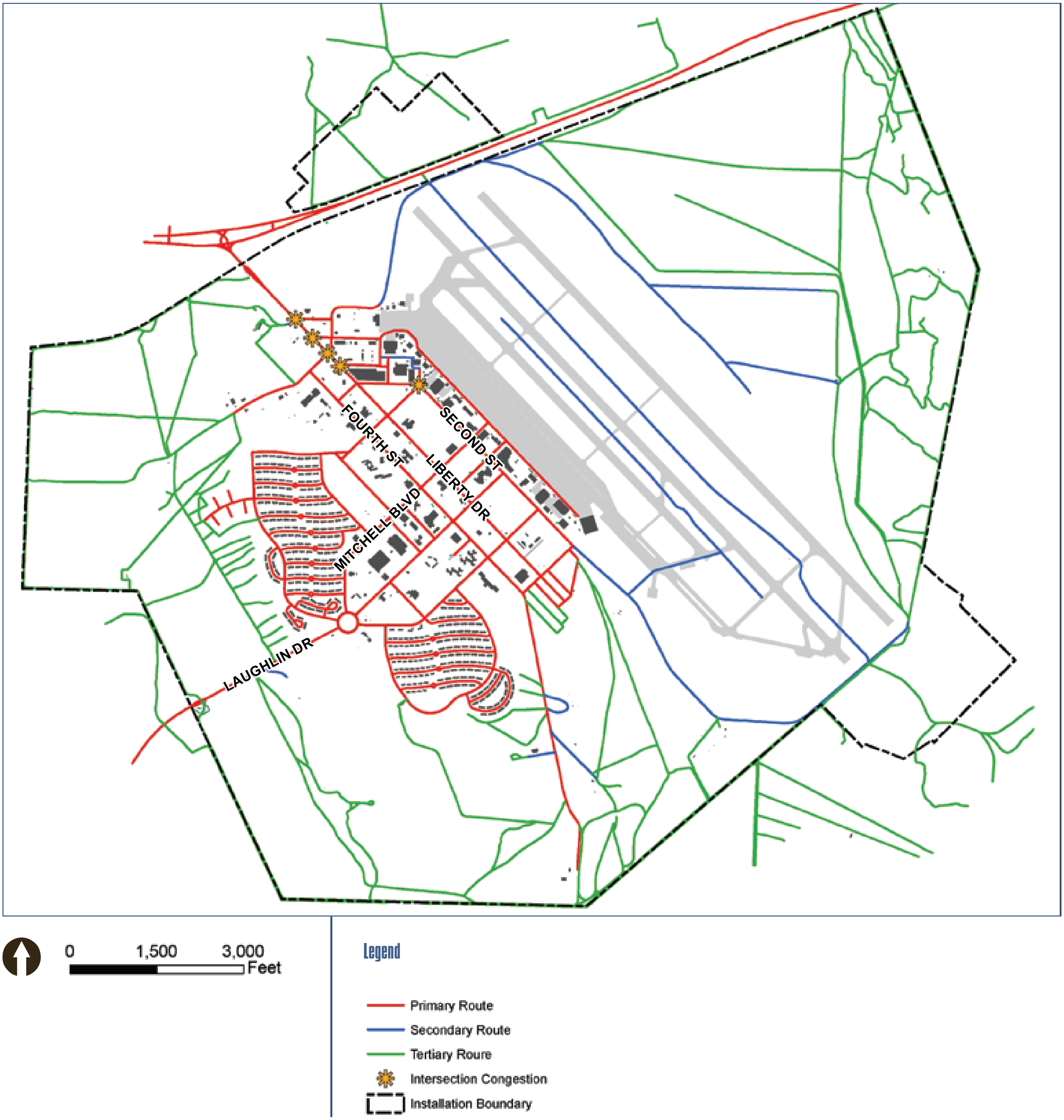
4.4.3 Base Architecture

The overall character and image of an installation such as Laughlin AFB is largely determined by the architectural style of its facilities. Most facilities are painted shades of beige with brown contrasting trim. Some buildings, such as the Fire Station (Building 220) and the Operations Training Complex (Building 320), use compatible colored concrete surfaces emphasizing texture.

A Planning Assistance Team from the Air Force Center for Environmental Excellence (AFCEE) completed the current Laughlin AFB Architectural Compatibility Guide in June 2006. This guide determined the following architectural goals for the base:

- Provide a framework to shape the architectural expression of individual architects and create a constant campus atmosphere across the base.
- Establish criteria for base construction projects that conform to architectural compatibility standards but allow for creativity and flexibility.
- Provide facilities that are long-lasting, have low life cycle costing, and flexible.

FIGURE 4-19 Transportation Map



The base guide breaks the facilities into three major architectural districts – Operations/Administrative/Industrial, Community Support, and Housing. The guide further addresses several site design factors in detail, including site development, focal point features, site access, landscaping, site furniture, walls and screens, exterior signage, exterior lighting, and AT/FP. Base planners and architects will use the guide to plan and design new facilities on Laughlin AFB to ensure future base facilities have a uniform and consistent appearance.

4.4.4 Landscape Architecture

The goal of Laughlin AFB's Landscape Development Plan is to efficiently allocate limited landscape resources, protect the existing natural environment, provide pleasing surroundings, and enhance the quality of life. The objective of the plan is to provide a framework guiding in-house, self-help, and contracted landscape projects. This document provides the information needed to maintain existing landscaped areas and develop new ones. Landscape design principles employed on Laughlin AFB include the following:

- Use shade tree massing and framing, surround turf transition areas, and use hardy, colorful shrubs in a landscaping theme.
- Use xeriscaping in all new construction and new landscaping projects.
- Use xeriscape plant material with inert material as streetscape landscaping.
- Use organic mulch rings around ornamental and shade trees planted in turf.
- Use earth berms to screen utility and delivery areas.
- Use moisture sensors in all new irrigation.
- Provide EMCS control of all new irrigation.
- Strictly adhere to approved plant material list.
- Improve and coordinate site amenities and furnishings.
- Provide shade trees in recreational areas.
- Encourage self-help projects in Privatized Housing area.
- Encourage wise and proper use of irrigation systems around high visibility facilities. Supplementary watering is utilized in other areas only as needed.
- Encourage hydromulching with native short-stem grasses and wildflowers in perimeter areas.
- Plant large evergreen and shade tree masses on south and west sides of facilities to aid in energy conservation.

4.5 CAPITAL IMPROVEMENT PROJECTS

The capital improvement projects in this section are recommended so that Laughlin AFB may realize its goals for pedestrian and vehicle circulation, space and land use efficiencies, and meeting the requirements set forth in Executive Orders 13327, 13423, and 13514. Figure 4-20 illustrates an overview of the recommended major capital improvement projects for Laughlin AFB, which are:

- Second Street Redevelopment
- Weather Shelter Relocation
- Pedestrian and Bicycle Circulation
- Town Center
- Streetscape
- General Landscape
- Golf Course Irrigation System
- Other Recommended Projects

FIGURE 4-20: Recommended Projects Overview Map

4.5.1 Second Street Redevelopment

Flightline-associated facilities and activities are the priority destinations for pedestrian and vehicular traffic on Laughlin AFB. While vehicular access and parking is convenient and logical, pedestrian/bicycle access and circulation is undefined and somewhat challenging. Second Street physically and visually separates the Flightline from the community support side of the installation. POV parking areas, open drainage channels, access roads, and paved hardstand areas, which line both sides of Second Street, further complicate safe, efficient, and aesthetically pleasing pedestrian/bicycle passage. The entire area lacks landscape definition and is devoid of any visual connections that could link the Flightline and community sides of the installation together. The following recommendations for Second Street redevelopment are illustrated in Figure 4-21.

Recommendation(s)

- Redevelop Second Street between Mitchell Boulevard and Monroe Boulevard.
  - Design a pedestrian and bicycle friendly environment that also supports GOVs, service vehicles, and emergency vehicles. By incorporating changes in pavement, seat walls and site furnishings, drought tolerant tree species and xeriscape, a serviceable ribbon of green can be developed that functionally and visually ties the distinct installation communities together. When implemented and physically connected to the proposed pedestrian and bicycle access collection nodes and access lanes, a unified circulation system can be achieved.
  - Install a flashing light system on the closed portion of Second Street to warn pedestrians of emergency vehicles.
- Redesign/rebuild POV parking area along Second Street between Mitchell Boulevard and Florida Avenue.
  - Create a pedestrian zone through the existing parking area that physically and visually connects Heritage Park to the Second Street pedestrian zone. Incorporate a raised walkway with enhanced paving, drought tolerant trees, and xeriscape.
  - Initiate a parking capacity study to determine possible expansion of the parking lot along Second Street across from Buildings 211 and 215. This will account for displaced POV parking spaces as a result of developing the pedestrian/bicycle connection linking Heritage Park to the Flightline and Second Street pedestrian zone.
- Establish Activity Hub adjacent to Buildings 307 and 308.
  - Create a courtyard type space that can be utilized for food vending, public gatherings, and pedestrian circulation while also accommodating GOV and emergency vehicle access. Incorporate drought tolerant tree species, xeriscape, site furnishings, and enhanced pavement to create a serviceable public space.

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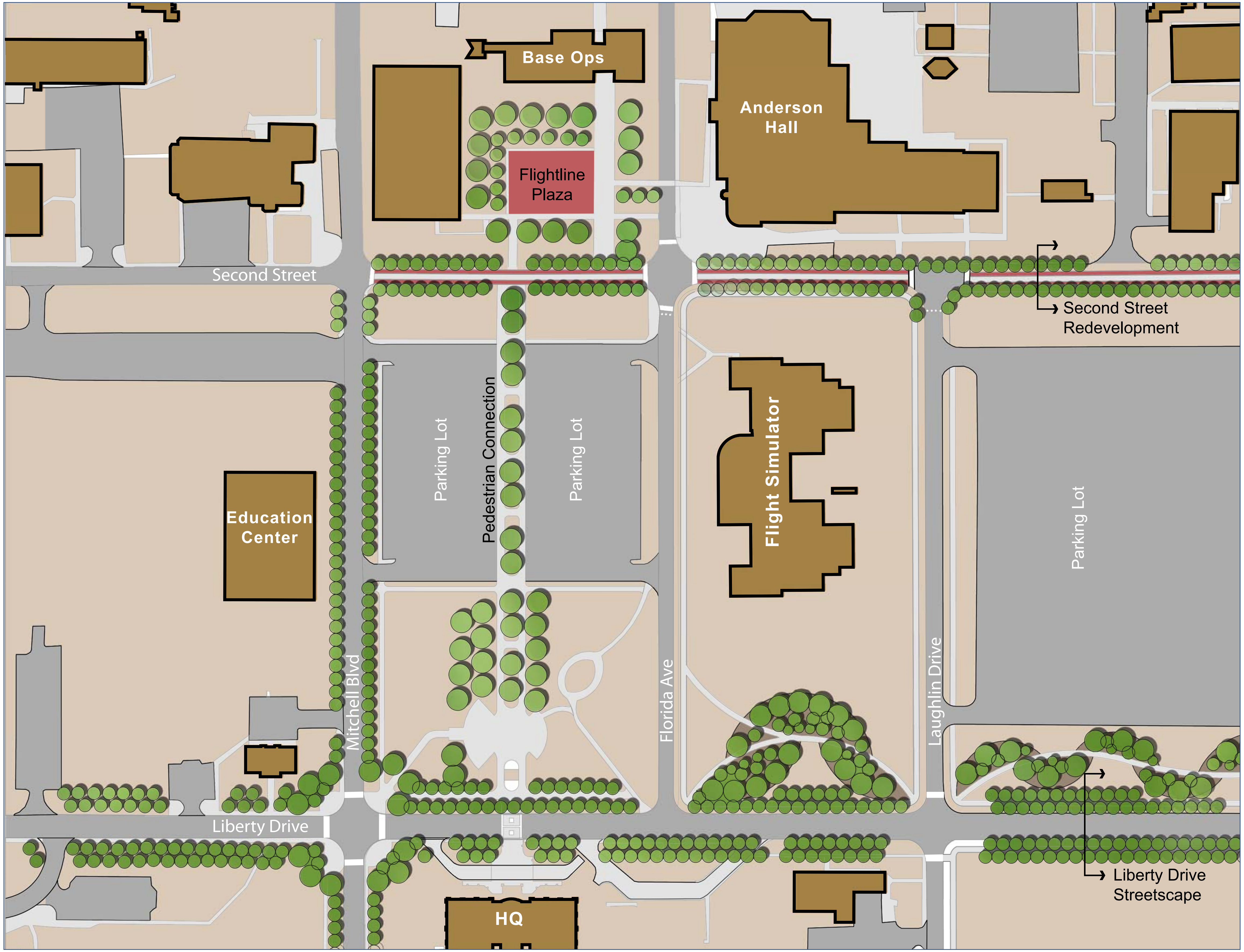

FIGURE 4-21: Proposed Corridor between Flightline and Headquarters

Improvements to the area between the Liberty Drive, Second Street, Mitchell Boulevard and Arnold Boulevard will increase opportunities for social interaction, community functions, and special events by creating direct pedestrian connections between facilities and establishing a variety of pleasing spaces. Changes in the pavement, seat walls and site furnishings, establishment of drought-tolerant tree specials and xeriscaping, small drought-tolerant turf stands, and installation of rock/aggregate mulch and boulders will create a serviceable ribbon of green that will functionally, visually, and socially connect to the proposed pedestrian/bicycle network, unifying the circulation system and establishing opportunities for a multitude of events.

The main thoroughfares along Liberty Drive and Mitchell Boulevard will be enhanced with streetscaping to enhance their importance in the circulation network. The intersection of Liberty Drive and Mitchell Boulevard should be enhanced with drought-tolerant plant material and xeriscaping, collection areas, and signage to improve its visual quality.

Establishing a plaza area near Base Operations and Anderson Hall creates opportunities for gathering, vendor stations, and other activities and is easily accessible to other nearby facilities along or near the Flightline. A direct pedestrian connection through the parking lot between Mitchell Boulevard and Florida Ave and connecting to Heritage Park will serve as a visual and physical link between Wing HQ and the Flightline.

Recapitalization of Second Street between Mitchell Boulevard and Arnold Boulevard creates a pedestrian and bicycle friendly environment while limiting access to GOVs, service and emergency vehicles, creating a functional thoroughfare for pedestrians and bicycle using the established green ribbon vernacular of the proposed pedestrian and bicycle circulation network while still providing necessary service and emergency access to facilities along the Flightline. Direct pedestrian and bicycle routes along Liberty Drive and the Second Street corridor will physically and visually link to the proposed Town Center development to the east.

4.5.2 Weather Shelter Relocation

The Flightline ADP recommends a contiguous expansion of the existing aircraft parking ramp. In order to achieve this while still providing required control tower visual sightlines, the existing Weather Shelter function needs to be relocated. The proposed location for the new Weather Shelter facility is adjacent to Building 414 and between Second Street and Liberty Drive (Figure 4-22). The new Weather Shelter location provides opportunities for it to function as a multi-use facility as well as the enhancement of pedestrian and bicycle connections. The new multi-use facility would provide the installation a place to hold ceremonies, dinners, and graduation functions, in addition to serving aircraft operations and protection needs. However, the installation of PACS on the parking apron would diminish the need to use the Weather Shelter for parking aircraft during inclement weather. Further expansion of the Flightline parking ramp in a southwest direction would also require relocating the FAMCamp, park, and recreation fields.

Recommendation(s)

- Demolish existing Weather Shelter and supporting infrastructure. Construct a new Weather Shelter in the block of land between Laughlin Drive and Arnold Boulevard. The new Weather Shelter should have doors to provide the maximum protection to aircraft during weather events.
- Create parallel taxiways from the existing ramp area to the proposed Weather Shelter and provide adequate ramp area for the functional area.
- Demolish and relocate existing tennis courts. Tennis courts should be relocated to a more centralized area that better supports the community. This frees up land to establish better physical and visual connection to the Headquarters Building and Heritage Park.
- Relocate the tennis courts, recreation fields, FAMCamp, and park between the Visitors Quarters and privatized housing, along Vandenberg Drive.
- Reconfigure the existing POV parking area in order to maximize green space around the proposed Weather Shelter.
- Create a pedestrian/bicycle hub plaza area that visually spans across Liberty Drive, connecting proposed pedestrian/bicycle hub plaza areas (Town Center) on each side of Arnold Boulevard.
- Configure Flightline fencing in such a way that provides the opportunity to secure the Flightline while functions are held inside the new Weather Shelter, as well as the ability to secure the Flightline to include the new Weather Shelter when it is used for aircraft operations.

4.5.3 Town Center

Laughlin AFB lacks elements that unify areas.

Recommendation(s)

The undeveloped area along Arnold Boulevard, between Liberty Drive and Fourth Street, will be developed into the Laughlin Town Center (Figure 4-22).

- This area will serve as the main hub area of the entire pedestrian/bicycle circulation system.
  - Create courtyard type spaces that can be utilized for food vending, public gatherings, and pedestrian/bicycle circulation. Incorporate drought tolerant tree species, xeriscape, site furnishings, and enhanced pavement to create a serviceable public space.
  - The proposed hub will visually and physically unite the Headquarters Building, Heritage Park, the proposed Weather Shelter, the Visitors Quarters, and the Unaccompanied Officers Quarters along Arnold Boulevard.

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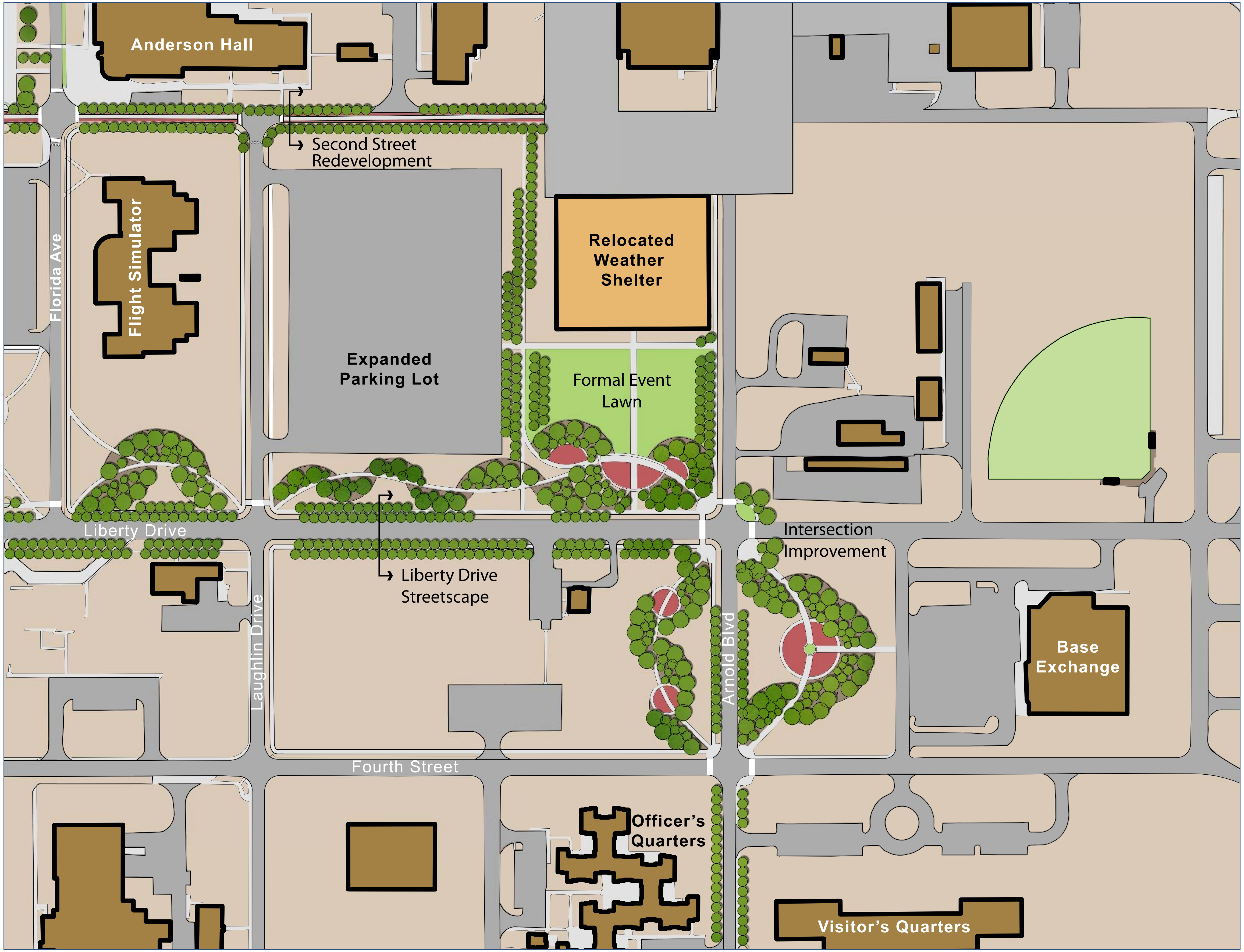
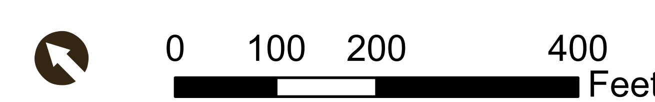


FIGURE 4-22: Proposed Town Center

The development of the Town Center will be spurred by the relocation of the Weather Shelter, forming a community focused terminus to the main thoroughfare of Liberty Drive. Relocating some existing recreational areas and expanding the apron access ramp to the relocated Weather Shelter will simultaneously allow for the expansion of the aircraft parking apron to the east and facilitate development of the Town Center.

Development of the Town Center will create a multitude of public gathering and hub spaces linked to the proposed pedestrian and bicycle circulation network, accommodating a wide variety and scale of community focused activities such as festivals, graduation ceremonies, car and air shows, and marathon and bicycle-type events. The existing parking lot along Laughlin Drive will be reconfigured and expanded to provide POV/GOV parking for large-scale events. Creation of a pedestrian/bicycle route, using the established green ribbon vernacular, along Liberty Drive and between the relocated Weather Shelter will link the Town Center area with improvements along Second Street and the Wing HQ areas.

Continuing streetscape improvements along Liberty Drive and Arnold Boulevard will enhance their importance in the vehicular circulation network, and the intersection of Liberty Drive and Arnold Boulevard be similarly enhanced to improve its visual quality. A large formal lawn area, established with drought-tolerant turf, will be located in proximity to the relocated Weather Shelter for hosting large scale events and temporary pavilion and vendor set-up. Smaller scale plazas and hub spaces along Liberty Drive near the formal lawn area and in the underutilized property along Arnold Drive link to the proposed pedestrian and bicycle circulation using the green ribbon vernacular, creating a holistic network of visually united spaces and routes throughout the base, servicing a variety of community activities.



4.5.5 Pedestrian And Bicycle Circulation

Laughlin AFB lacks a comprehensive pedestrian and bicycle circulation system that physically links the community elements (Figures 4-21 through 4-23). Pedestrian paths are ideal because they provide visual interest, safety, and convenience, in addition to being ADA-compliant.

Recommendation(s)

- Create a trail system that provides logical collection points (hubs).
- Design a system that meanders thru undeveloped areas providing primary linkages through the community.
- Utilize the meandering characteristic of the trail system to establish ribbons of green. The use of drought tolerant trees, xeriscaping, stone mulches and accent boulders, visually establishes the ribbon of green running through the community. Utilizing this approach, irrigation is limited only to the immediate area and not wasted on large expanses of undeveloped property. Selective use of trees adjacent to the trail system provides shade and visual delineation.
- Provide additional bicycle parking/rack at Flightline training facilities (Buildings 320, 328, and 307) in the event that on-base students are prohibited from driving to class.

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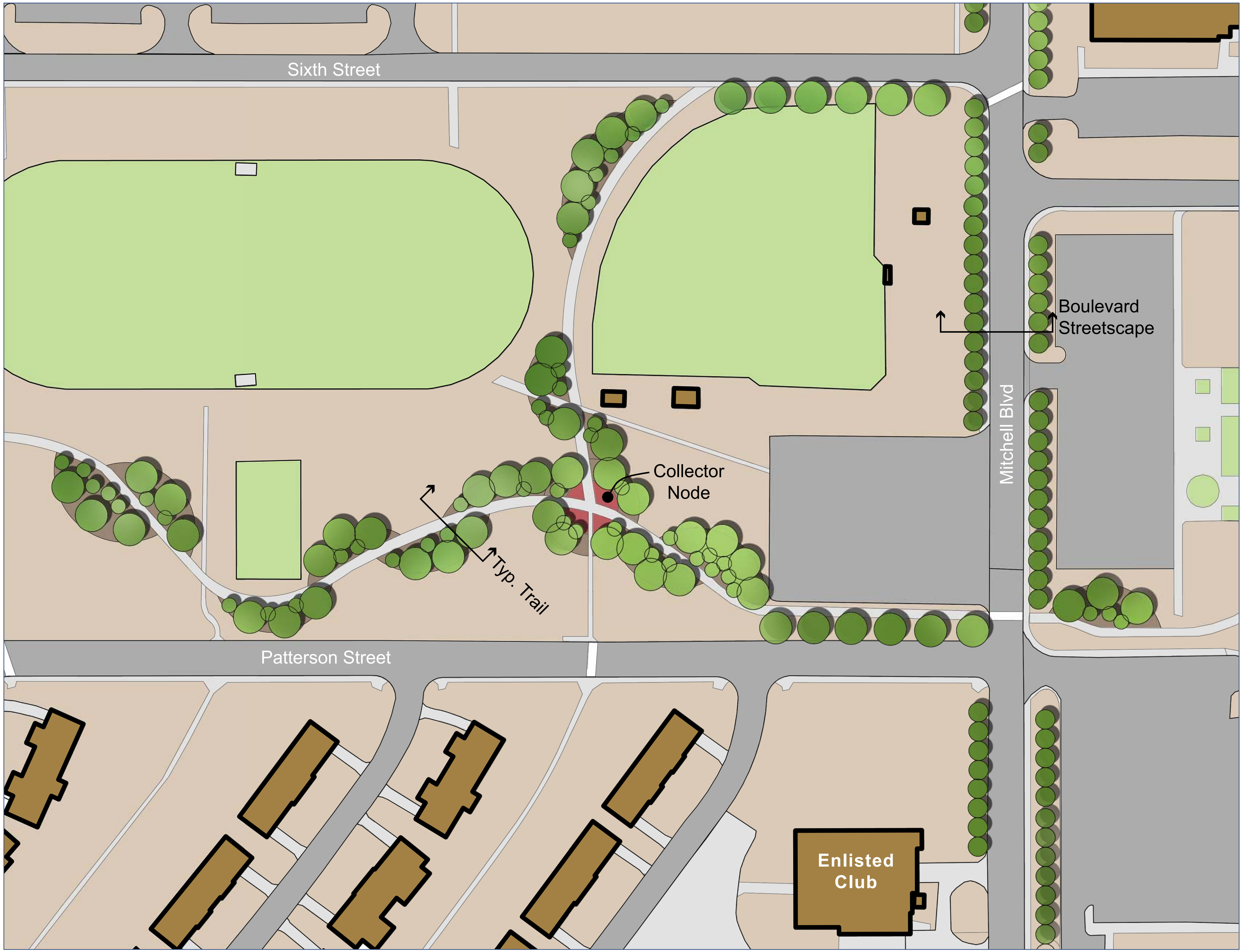


FIGURE 4-23: Proposed Pedestrian and Bicycle Circulation

Improvements to the pedestrian and bicycle circulation throughout the base will include changes in the pavement, seat walls and site furnishings, establishment of drought-tolerant tree species and xeriscaping, small drought-tolerant turf stands, and installation of rock/aggregate mulch and boulders. Such improvements will create a serviceable ribbon of green that will unify the existing circulation system with a visual green ribbon vernacular, uniting a variety of areas on base.

Wherever possible, pedestrians and bicycles should share common lanes separate from vehicular circulation to reduce accident potential. Establish collection nodes at common pedestrian/bicycle intersections near established base amenities and offer some site furnishings, shade from trees, watering stations, signage, and opportunities for small scale social interactions and activities. Route establishment creates a network of loops unified using the green ribbon vernacular, providing efficient access to base-wide facilities and a variety of visual, physical, and social interests for the population of Laughlin AFB.

4.5.6 General Landscape

Laughlin AFB has many unimproved areas that look visually unappealing due to the inefficiency, or lack of, irrigation, spotty landscaping and tree placement, and the extensive use of turf grass.

Recommendation(s)

- Areas not delineated as ribbons of green should become unimproved open space areas.
  - Replace turf areas with aggregate mulches, accent boulders and xeriscape plant material not requiring irrigation.
  - Retain mature/specimen trees and install drip irrigation. Augment these areas with xeriscape so that islands of green interrupt large expanses of aggregate mulch.
- Landscape main entrances to buildings. Replace high maintenance landscape material with xeriscape mulched with aggregate material. Provide drought tolerant trees to minimize the heat island effect, to provide shade, and to reduce solar gain on buildings. Install drip irrigation in order to reduce consumption of potable water.

4.5.4 Streetscape

Laughlin AFB lacks a unified streetscape. Figures 4-24 through 4-27 illustrate proposed streetscapes of the primary thoroughfares for vehicular, pedestrian, and bicycle traffic.

Recommendation(s)

- Identify Liberty Drive as the primary streetscape on Laughlin AFB.
- Identify Mitchell Boulevard and Arnold Boulevard as secondary streetscapes on Laughlin AFB.
  - Incorporate pedestrian walkways, drought tolerant trees, limited turf grass areas, xeriscape, rock mulches and accent boulders, and aesthetic screen walls and/or seat walls to visually/functionally unify the installation and functional areas.
- Identify key vehicular intersections and enhance with drought tolerant trees, limited turf grass areas, xeriscape, and seasonal flowers. These enhancements will provide visual identity and enhance the overall visual appeal of the area.
- Consult with a bird expert regarding the recommended trees to plant so as not to attract any bird species that would interfere with aircraft operations and BASH.

FIGURE 4-24: Proposed Second Street Cross Section

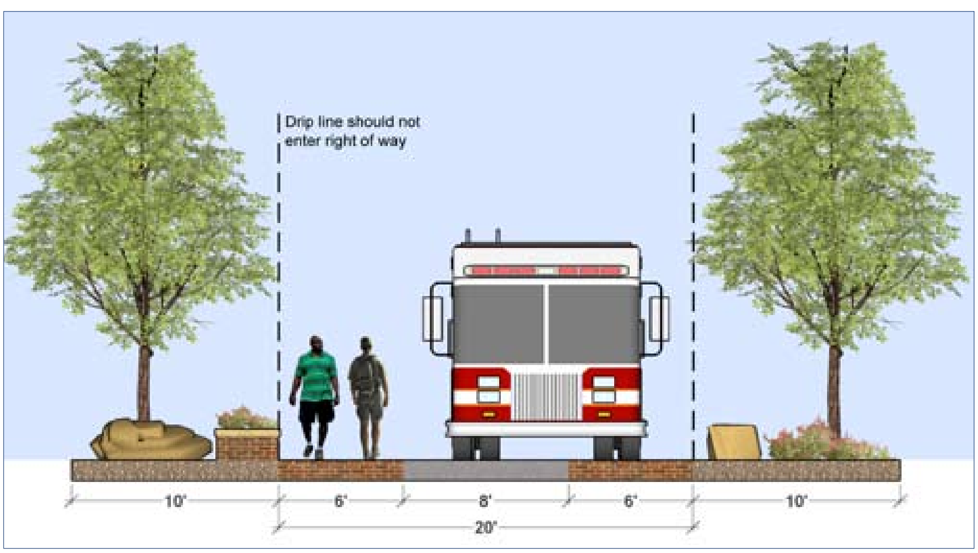


FIGURE 4-25: Proposed Liberty Drive Cross Section

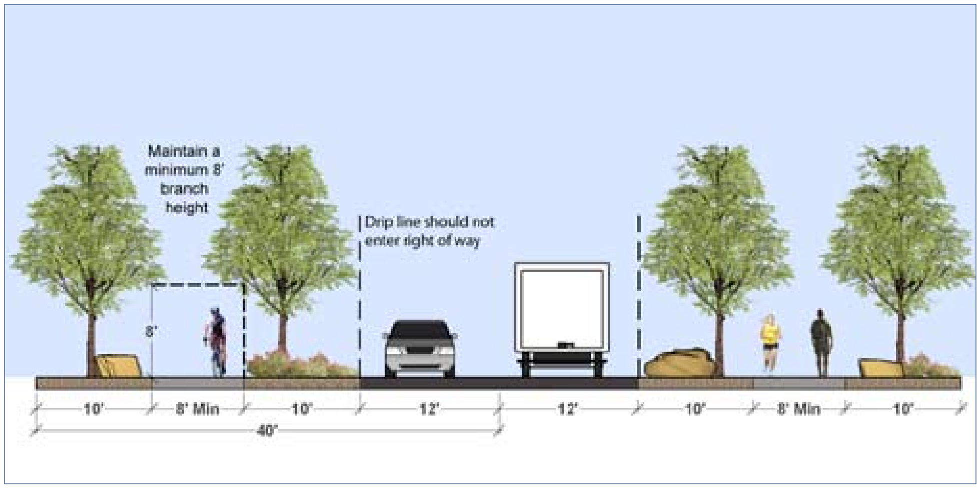


FIGURE 4-26: Proposed Arnold Boulevard Cross Section

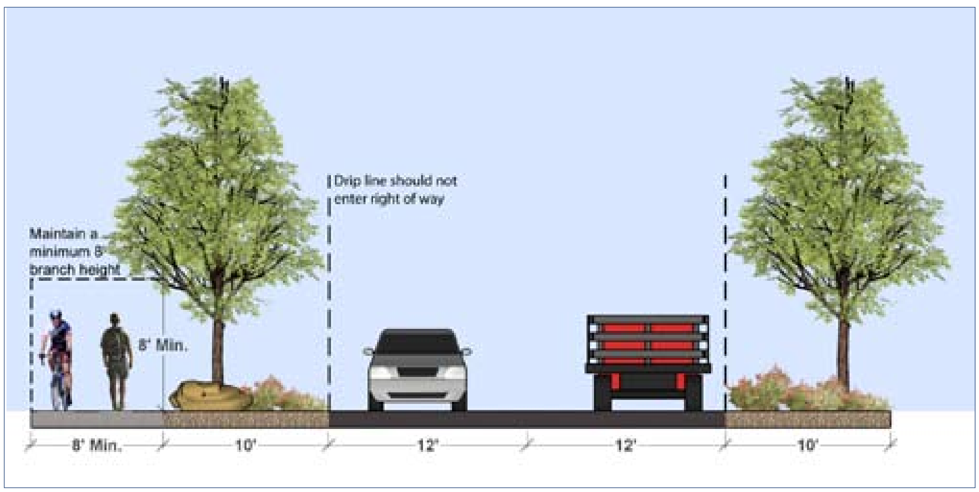
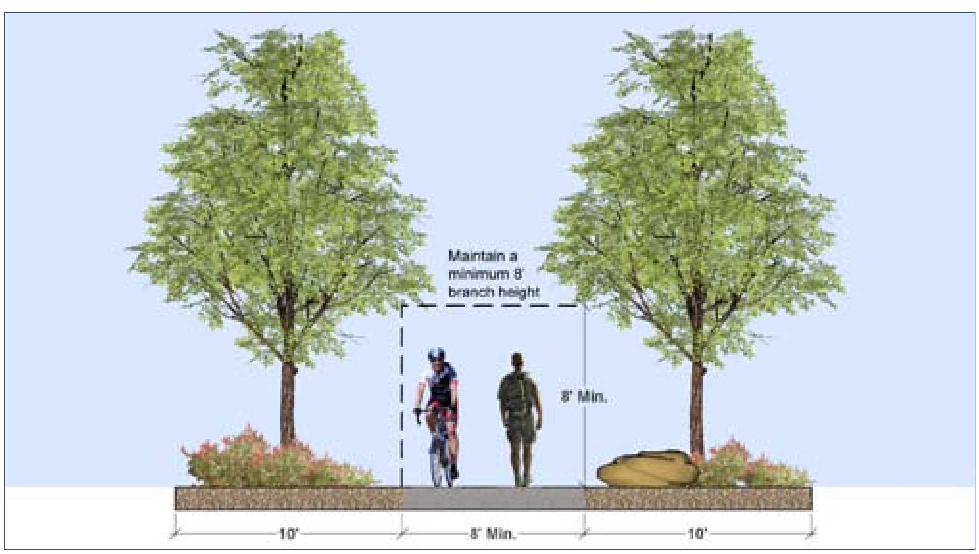


FIGURE 4-27: Proposed Typical Trail Cross Section



4.5.7 Golf Course Irrigation System

The U. S. Air Force Golf Course Environmental Management (GEM) program is a proactive Air Force Center for Environmental Excellence (AFCEE) initiative to foster a better understanding of the environmental challenges facing our golf courses worldwide. Armed with the support and approval of the Air Force Services Agency golf program, AFCEE's goal is to facilitate the creation of an environmentally friendly golf course facility while supporting the installation mission. AFI 32-7064 requires a GEM Plan as part of the Integrated Natural Resources Management Plan (INRMP).

The primary tenets of the GEM Program are to minimize or eliminate potential negative environmental impacts, attain and maintain daily compliance with all appropriate regulations, and constantly examine all aspects of golf course management to achieve the highest standards of environmental excellence. Laughlin AFB does not currently participate with the GEM program.

A key component of the GEM program is water conservation. Additionally, in order for Laughlin AFB to comply with Executive Order 13514 - Federal Leadership in Environmental, Energy, and Economic Performance, the golf course must improve its water use efficiency. It has been reported that the golf course and/or installation irrigation uses up to 50% of the potable water consumed by the installation.

Recommendation(s)

- A study should be performed to determine the efficiency of the existing irrigation system. Additionally, opportunities should be explored to utilize non-potable water for golf course and installation wide irrigation.
- Initiate the GEM Program
- Explore options for replacing/upgrading existing irrigation system
  - Utilize WaterSense approved system – www.epa.gov/watersense
  - Incorporate soil moisture sensors; weather stations capable of determining ambient temperature, humidity, and wind speed; develop a system that is controlled by a centralized computer.
- Explore options for replacing existing turf grass species. New species of grass have been developed for their drought tolerant abilities and playability.

4.5.8 Other Recommended Projects

- In order to gain the necessary efficiencies and aircraft parking space, initiate a project to expand the aircraft parking apron as recommended in this General Plan and in the Flightline ADP.
- Significant health concerns are associated with Building 58, which is a corrosion control facility. This building is documented to have hexavalent chromium exposure, and it is not set up to adequately handle working with OSHA expanded standard chemicals such as hexavalent chromium. The workers do not have adequate space in the facility to function without a cross-contamination hazard. Currently, the workers must change into their Personal Protection Equipment (PPE) outside the roll up doors, and then take off the PPE inside the booth. Building 58 is not air conditioned, and the booths (blast and paint) are essentially a box within a box. Only one small break area (approximately 10 ft x 10 ft) is air conditioned. A modification of the entire facility is required in order to correct the functionality and address the health safety concerns of Building 58.
- Relocate FAMCamp to the area between the Visitors Quarters and privatized housing. This would place the FAMCamp in close proximity to laundry facilities, and it would also allow for expansion of Flightline aircraft parking apron and facilities.
- For safety and a more pedestrian and bicycle friendly campus, a project is needed to develop a comprehensive sidewalk plan throughout Laughlin AFB.

5.0 GENERAL PLAN MAINTENANCE AND REVISION

While the General Plan needs to take a comprehensive and long-term look at the installation, the plan must also stay current with the changing environment at the installation. Laughlin AFB will need to maintain and update the General Plan to ensure that it provides an accurate picture of current conditions and future plans.

5.1 RESPONSIBILITIES

The following section lists the responsibilities of those involved directly in the preparation, use, and implementation of the General Plan.

- **Air Education and Training Command (AETC)** Headquarters, AETC, Directorate of Civil Engineering, is responsible for reviewing and approving the General Plan. This review is based on Air Force regulations and instructions and an evaluation of the plan's consistency with the goals and objectives of AETC and other applicable planning documents.

- **47th Flying Training Wing Commander (47 FTW/CC)** The 47 FTW Commander is responsible for the resources on Laughlin AFB and must ensure that these resources are effectively used toward the achievement of the base's mission. Accordingly, the General Plan needs to reflect and convey the Commander's direction on these resources. In reviewing future projects or programs, decision-makers should rely on the guidance provided in the General Plan.

- **Laughlin Facilities Utilization Board** The Laughlin Facilities Utilization Board is comprised of the 47 FTW Commander, group commanders, and other senior leadership members on the base. The Facilities Utilization Board is responsible for assessing facility needs and setting priorities for new construction, major maintenance/repair projects, and the overall use of existing facilities.

- **47th Civil Engineer Squadron (47 CES)** The 47 CES is the principal proponent of the General Plan. The 47 CES promotes and maintains the General Plan. As directed by the 47 FTW Commander, 47 CES staff is responsible for facilitating reviews and implementing updates of the General Plan. They are the day-to-day managers of the General Plan.

- **Group Commanders, Functional Leaders, Tenant Units** All commanders and functional leaders are responsible for being familiar with the General Plan. They are also responsible for notifying 47 CES of any changes they feel are necessary to reflect current conditions or plans.

5.2 MAINTENANCE PROCEDURES

If a General Plan's major role is to support informed decision making, it must reflect current conditions and plans in order to be relevant. To support this role, the General Plan needs to be continuously reviewed by its users, with noted changes provided to the 47 CES when identified.

General Plan Education and Communication

To ensure that the General Plan remains accurate and relevant, the 47 FTW Commander shall facilitate a consistency review on an annual basis. In addition, a comprehensive update shall be scheduled every five years. Of course, major changes at the base, such as a new mission, may require an update in a shorter timeframe. Proposed changes to the General Plan that are administrative or editorial in nature can be made directly by the 47 CES. Changes of a substantive nature, as determined by the 47 CES Commander, and facility siting changes that require major command review will be referred to the Facilities Utilization Board for review and direction.

These changes will then be forwarded to AETC for review and comment prior to implementation.

A

APPENDIX A

POINTS OF CONTACT

1. **Base Civil Engineer**
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   Laughlin AFB, TX 78843-5233
   Telephone: 830.298.5252
   Email: 47ces/cc@laughlin.af.mil

2. **Chief of Asset Optimization**
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   DSN: 312.732.5067

3. **Community Planner**
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   Telephone: 830.298.4299
   DSN: 312.732.4299

4. **Chief of Program Development**
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APPENDIX B

B

ACRONYMS

434 FTS	434th Fighter Training Squadron
47 CES	47th Civil Engineer Squadron
47 CONS	47th Contracting Squadron
47 FSS	47th Force Support Squadron
47 FTW	47th Flying Training Wing
47 FTW/CC	47th Flying Training Wing Commander
47 LRD	47th Logistics Readiness Division
47 MDG	47th Medical Group
47 MDOS	47th Medical Operations Squadron
47 MDSS	47th Medical Support Squadron
47 MSG	47th Mission Support Group
47 OG	47th Operations Group
47 OSS	47th Operations Support Squadron
47 SFS	47th Security Forces Squadron
84 FTS	84th Flying Training Squadron
85 FTS	85th Flying Training Squadron
86 FTS	86th Flying Training Squadron
87 FTS	87th Flying Training Squadron
96 FTS	96th Flying Training Squadron
AAFES	Army and Air Force Exchange Service
ADP	Area Development Plan
AEP	American Electric Power
AETC	Air Education and Training Command
AFB	Air Force Base
AFCEE	Air Force Center for Environmental Excellence
AFCESA	Air Force Civil Engineer Support Agency
AFI	Air Force Instruction
AFOSI	Air Force Office of Special Investigations
AFPD	Air Force Policy Directive
AICUZ	Air Installation Compatible Use Zone
AOC	Area of Concern
APZ	Accident Potential Zone
AST	Aboveground Storage Tank
AT/FP	Antiterrorism/Force Protection

BASH	Bird/wildlife Aircraft Strike Hazard
BCE	Base Commercial Equipment
BOS	Base Operating Support
BRAC	Base Realignment and Closure
BRL	Building Restriction Line
BX	Base Exchange
CAT	Category
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act (aka Superfund)
CIP	Capital Improvement Program
CITS	Centralized Information Transport System
DASR	Digital Airport Surveillance Radar
dB	Decibels
DECA	Defense Commissary Agency
DESC	Defense Energy Support Center
DNL	Day-Night Noise Levels
DoD	Department of Defense
DRMO	Defense Reutilization Marketing Office
EMCS	Energy Management Control System
EOC	Emergency Operations Center
EPA	Environmental Protection Agency
ERP	Environmental Restoration Program
ETJ	Extended Territorial Jurisdiction
F	Fahrenheit
FAMCamp	Family Campground
FAR	Federal Aviation Regulation
FHMP	Family Housing Master Plan
FIX	Facility Infrastructure Examination
FY	Fiscal Year
Gig-E	Gigabit Ethernet
GOV	Government Owned Vehicle
GPM	Gallon per Minute
HQ USAF	Headquarters United States Air Force
ICM	Inventory Control Management
ICRMP	Integrated Cultural Resource Management Plan
IDIQ	Indefinite Delivery Indefinite Quantity
IFF	Introduction to Fighter Fundamentals
ILS	Instrument Landing System
INRMP	Integrated Natural Resource Management Plan
IPV	Internet Protocol Version
IRP	Installation Restoration Program
ITT	Information, Tickets, and Tours

JTRS	Joint Tactical Radio System
Kva	Kilovolt Amps
LAN	Local Area Network
LBP	Lead-based Paint
LCSAM	Laughlin Civil Service Aircraft Maintenance
LED	Light Emitting Diodes
LF	Linear feet
LMR	Land Mobile Radio System
Lt	Lieutenant
LTM	Long-term Monitoring
MAA	Military Affairs Association
MFH	Military Family Housing
MILCON	Military Construction
MSL	Mean Sea Level
NAF	Non-appropriated Fund
NAFTA	North American Free Trade Agreement
NDI	Non-destructive Inspection
NEXRAD	Next Generation Weather Radar
NFA/NFRAP	No Further Action/No Further Response Action Planned
NRHP	National Register of Historical Places
OWS	Oil-Water Separator
PACS	Protective Aircraft Canopy Shelters
PAPI	Precision Approach Path Indicators
PIV	Post Indicator Valves
PPE	Personal Protection Equipment
psi	Pounds per Square Inch
PVC	Polyvinyl Chloride
Q-D	Quantity-Distance
RAB	Restoration Advisory Board
RAPCON	Radar Approach Control
RSU	Runway Supervisory Unit
RV	Recreational Vehicle
SFS	Security Forces Squadron
STEM-B	System Telecommunications Engineering Manager
SUPT	Student Undergraduate Pilot Training
TCEQ	Texas Commission on Environmental Quality
TEA-21	Transportation Equity Act for the 21st Century
TLF	Temporary Lodging Facility
TNRCC	Texas Natural Resource Conservation Commission

UFC	Unified Facilities Criteria
UOQ	Unaccompanied Officers Quarters
US 90	US Highway 90
USACE	United States Army Corps of Engineers
USAF	United States Air Force
USPS	United States Postal Service
UST	Underground Storage Tank
VCR	Vacuum Circuit Reclosures
VHF	Very High Frequency
VORTAC	Very High Frequency Omni-Directional Radio Range Tactical Air Navigation Aid

C

APPENDIX C

LAND USE COMPATIBILITY, NOISE EXPOSURE, AND ACCIDENT POTENTIAL TABLE

Source: Laughlin AFB AICUZ Study, 2008

Table 3-4. Land Use Compatibility, Noise Exposure, and Accident Potential.

LAND USE		ACCIDENT POTENTIAL ZONES			NOISE ZONES			
SLUCM NO.	NAME	CLEAR ZONE	APZ I	APZ II	65-69 dB	70-74 dB	75-79 dB	80+ dB
10	Residential							
11	Household units							
11.11	Single units; detached	N	N	Y[1]	A[11]	B[11]	N	N
11.12	Single units; semidetached	N	N	N	A[11]	B[11]	N	N
11.13	Single units; attached row	N	N	N	A[11]	B[11]	N	N
11.21	Two units; side-by-side	N	N	N	A[11]	B[11]	N	N
11.22	Two units; one above the other	N	N	N	A[11]	B[11]	N	N
11.31	Apartments; walk up	N	N	N	A[11]	B[11]	N	N
11.32	Apartments; elevator	N	N	N	A[11]	B[11]	N	N
12	Group quarters	N	N	N	A[11]	B[11]	N	N
13	Residential hotels	N	N	N	A[11]	B[11]		N
14	Mobile home parks or courts	N	N	N	N	N	N	N
15	Transient lodgings	N	N	N	A[11]	B[11]	C[11]	N
16	Other residential	N	N	N[1]	A[11]	B[11]	N	N
20	Manufacturing							
21	Food & kindred products; manufacturing	N	N[2]	Y	Y	Y[12]	Y[13]	Y[14]
22	Textile mill products; manufacturing	N	N[2]	Y	Y	Y[12]	Y[13]	Y[14]
23	Apparel and other finished products made from fabrics, leather, and similar materials; manufacturing	N	N	N[2]	Y	Y[12]	Y[13]	Y[14]
24	Lumber and wood products (except furniture); manufacturing	N	Y[2]	Y	Y	Y[12]	Y[13]	Y[14]
25	Furniture and fixtures; manufacturing	N	Y[2]	Y	Y	Y[12]	Y[13]	Y[14]
26	Paper & allied products; manufacturing	N	Y[2]	Y	Y	Y[12]	Y[13]	Y[14]
27	Printing, publishing, and allied industries	N	Y[2]	Y	Y	Y[12]	Y[13]	Y[14]
28	Chemicals and allied products; manufacturing	N	N	N[2]	Y	Y[12]	Y[13]	Y[14]
29	Petroleum refining and related industries	N	N	N	Y	Y[12]	Y[13]	Y[14]
30	Manufacturing							
31	Rubber and misc. plastic products, manufacturing	N	N[2]	N[2]	Y	Y[12]	Y[13]	Y[14]
32	Stone, clay and glass products manufacturing	N	N[2]	Y	Y	Y[12]	Y[13]	Y[14]
33	Primary metal industries	N	N2	Y	Y	Y12	Y13	Y14

Table 3-4. Land Use Compatibility, Noise Exposure, and Accident Potential (cont'd).

LAND USE		ACCIDENT POTENTIAL ZONES			NOISE ZONES			
SLUCM NO.	NAME	CLEAR ZONE	APZ I	APZ II	65-69 dB	70-74 dB	75-79 dB	80+ dB
34	Fabricated metal products; manufacturing	N	N[2]	Y	Y	Y[12]	Y[13]	Y[14]
35	Professional, scientific, and controlling instruments; photographic and optical goods; watches and clocks manufacturing	N	N	N[2]	Y	A	B	N
39	Miscellaneous manufacturing	N	Y[2]	Y[2]	Y	Y[12]	Y[13]	Y[14]
40	Transportation, communications and utilities							
41	Railroad, rapid rail transit and street railroad transportation	N[3]	Y[4]	Y	Y	Y[12]	Y[13]	Y[14]
42	Motor vehicle transportation	N[3]	Y	Y	Y	Y[12]	Y[13]	Y[14]
43	Aircraft transportation	N[3]	Y[4]	Y	Y	Y[12]	Y[13]	Y[14]
44	Marine craft transportation	N[3]	Y[4]	Y	Y	Y[12]	Y[13]	Y[14]
45	Highway & street right-of-way	N[3]	Y	Y	Y	Y[12]	Y[13]	Y[14]
46	Automobile parking	N[3]	Y[4]	Y	Y	Y[12]	Y[13]	Y[14]
47	Communications	N[3]	Y[4]	Y	Y	A[15]	B[15]	N
48	Utilities	N[3]	Y[4]	Y	Y	Y	Y[12]	Y[13]
49	Other transportation communications and utilities	N[3]	Y[4]	Y	Y	A[15]	B[15]	N
50	Trade							
51	Wholesale trade	N	Y[2]	Y	Y	Y[12]	Y[13]	Y[14]
52	Retail trade-building materials, hardware and farm equipment	N	Y[2]	Y	Y	Y[12]	Y[13]	Y[14]
53	Retail trade-general merchandise	N[2]	N[2]	Y[2]	Y	A	B	N
54	Retail trade-food	N[2]	N[2]	Y[2]	Y	A	B	N
55	Retail trade-automotive, marine craft, aircraft and accessories	N[2]	N[2]	Y[2]	Y	A	B	N
56	Retail trade-apparel and accessories	N[2]	N[2]	Y[2]	Y	A	B	N
57	Retail trade-furniture, home furnishings and equipment	N[2]	N[2]	Y[2]	Y	A	B	N
58	Retail trade-eating and drinking establishments	N	N	N2	Y	A	B	N
59	Other retail trade	N	N[2]	Y[2]	Y	A	B	N
60	Services							
61	Finance, insurance and real estate services	N	N	Y[6]	Y	A	B	N
62	Personal services	N	N	Y[6]	Y	A	B	N

Table 3-4. Land Use Compatibility, Noise Exposure, and Accident Potential (cont'd).

LAND USE		ACCIDENT POTENTIAL ZONES			NOISE ZONES			
SLUCM NO.	**NAME**	**CLEAR ZONE**	**APZ I**	**APZ II**	**65-69 dB**	**70-74 dB**	**75-79 dB**	**80+ dB**
62.4	Cemeteries	N	Y[7]	Y[7]	Y	Y[12]	Y[13]	Y[14,2,1]
63	Business services	N	Y[8]	Y[8]	Y	A	B	N
64	Repair services	N	Y[2]	Y	Y	Y[12]	Y[13]	Y[14]
65	Professional services	N	N	Y[6]	Y	A	B	N
65.1	Hospitals, nursing homes	N	N	N	A*	B*	N	N
65.1	Other medical facilities	N	N	N	Y	A	B	N
66	Contract construction services	N	Y[6]	Y	Y	A	B	N
67	Governmental services	N[6]	N	Y[6]	Y*	A*	B*	N
68	Educational services	N	N	N	A*	B*	N	N
69	Miscellaneous services	N	N[2]	Y[2]	Y	A	B	N
70	Cultural, entertainment and recreational							
71	Cultural activities (including churches)	N	N	N[2]	A*	B*	N	N
71.2	Nature exhibits	N	Y[2]	Y	Y*	N	N	N
72	Public assembly	N	N	N	Y	N	N	N
72.1	Auditoriums, concert halls	N	N	N	A	B	N	N
72.11	Outdoor music shell, amphitheaters	N	N	N	N	N	N	N
72.2	Outdoor sports arenas, spectator sports	N	N	N	Y[17]	Y[17]	N	N
73	Amusements	N	N	Y[8]	Y	Y	N	N
74	Recreational activities (including golf courses, riding stables, water recreation)	N Y	Y[8, 9, 10]	Y	Y*	A*	B*	N
75	Resorts and group camps	N	N	N	Y*	Y*	N	N
76	Parks	N	Y[8]	Y[8]	Y*	Y*	N	N
79	Other cultural, entertainment and recreation	N[9]	Y[9]	Y[9]	Y*	Y*	N	N
80	Resources production and extraction							
81	Agriculture (except livestock)	Y[16]	Y	Y	Y[18]	Y[19]	Y[20]	Y[20, 21]
81.5 to 81.7	Livestock farming and animal breeding	N	Y	Y	Y[18]	Y[19]	Y[20]	Y[20, 21]
82	Agricultural related activities	N	Y[5]	Y	Y[18]	Y[19]	N	N
83	Forestry activities and related services	N[5]	Y	Y	Y[18]	Y[19]	Y[20]	Y[20, 21]
84	Fishing activities and related services	N[5]	Y[5]	Y	Y	Y	Y	Y

Table 3-4. Land Use Compatibility, Noise Exposure, and Accident Potential (cont'd).

LAND USE		ACCIDENT POTENTIAL ZONES			NOISE ZONES			
SLUCM NO.	NAME	CLEAR ZONE	APZ I	APZ II	65-69 dB	70-74 dB	75-79 dB	80+ dB
85	Mining activities and related services	N	Y[5]	Y	Y	Y	Y	Y
89	Other resources production and extraction	N	Y[5]	Y	Y	Y	Y	Y

LEGEND SLUCM - Standard Land Use Coding Manual, U.S. Department of Transportation.
Y = (Yes); Land use and related structures are compatible without restriction.
N = (No); Land use and related structures are not compatible and should be prohibited.
Y^x = (Yes with restrictions); Land use and related structures are generally compatible; see note indicated by the superscript.
N^x = (No with exceptions); See note indicated by the superscript.
NLR = (Noise Level Reduction; NLR) (outdoor to indoor); To be achieved through incorporation of noise attenuation measures into the design and construction of the structures.
A, B, or C = Land use and related structures generally compatible; measures to achieve NLR of A (25 dB), B (30 dB), or C (35 dB) should be incorporated into the design and construction of structures.
A*, B*, and C* = Land use generally compatible with NLR. However, measures to achieve an overall noise level reduction do not necessarily solve noise difficulties and additional evaluation is warranted. See appropriate footnotes.
* = The designation of these uses as "compatible" in this zone reflects individual federal agency and program consideration of general cost and feasibility factors, as well as past community experiences and program objectives. Localities, when evaluating the application of these guidelines to specific situations, may have different concerns or goals to consider.

NOTES
[1]Suggested maximum density of 1-2 dwelling units per acre possibly increased under a Planned Unit Development (PUD) where maximum lot coverage is less than 20 percent.
[2]Within each land use category, uses exist where further definition may be needed due to the variation of densities in people and structures. Shopping malls and shopping centers are considered incompatible in any APZ.
[3]The placing of structures, buildings, or above ground utility lines in the clear zone is subject to severe restrictions. In a majority of the clear zones, these items are prohibited. See AFI 32-7063 and AFI 32-1026 for specific guidance.
[4]No passenger terminals and no major above ground transmission lines in APZ I.
[5]Factors to be considered: labor intensity, structural coverage, explosive characteristics, and air pollution.
[6]Low-intensity office uses only. Meeting places, auditoriums, etc., are not recommended.
[7]Excludes chapels.
[8]Facilities must be low intensity.
[9]Clubhouse not recommended.
[10]Areas for gatherings of people are not recommended.
[11a]Although local conditions may require residential use, it is discouraged in DNL 65-69 dB and strongly discouraged in DNL 70-74 dB. An evaluation should be conducted prior to approvals, indicating that a demonstrated community need for residential use would not be met if development were prohibited in these zones, and that there are no viable alternative locations.
[11b]Where the community determines the residential uses must be allowed, measures to achieve outdoor to indoor NLR for DNL 65-69 dB and DNL 70-74 dB should be incorporated into building codes and considered in individual approvals.
[11c]NLR criteria will not eliminate outdoor noise problems. However, building location and site planning, and design and use of berms and barriers can help mitigate outdoor exposure, particularly from near ground level sources. Measures that reduce outdoor noise should be used whenever practical in preference to measures which only protect interior spaces.
[12]Measures to achieve the same NLR as required for facilities in the DNL 65-69 dB range must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.
[13]Measures to achieve the same NLR as required for facilities in the DNL 70-74 dB range must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.
[14]Measures to achieve the same NLR as required for facilities in the DNL 75-79 dB range must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.
[15]If noise sensitive, use indicated NLR; if not, the use is compatible.
[16]No buildings.
[17]Land use is compatible provided special sound reinforcement systems are installed.
[18]Residential buildings require the same NLR required for facilities in the DNL 65-69 dB range.
[19]Residential buildings require the same NLR required for facilities in the DNL 70-74 dB range.
[20]Residential buildings are not permitted.
[21]Land use is not recommended. If the community decides the use is necessary, hearing protection devices should be worn by personnel.